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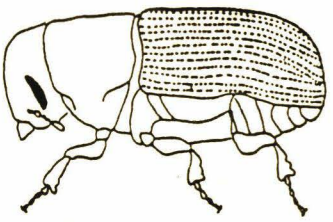
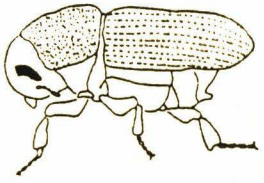
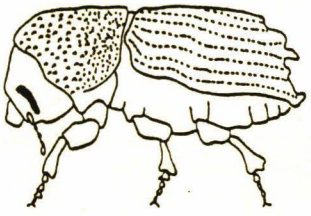


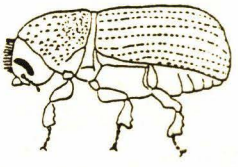
Bark Beetle Conditions

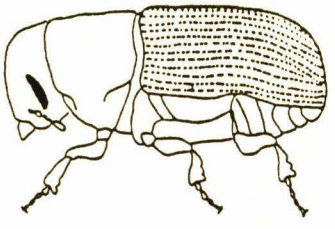
Northern Region

1987









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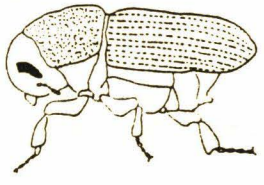

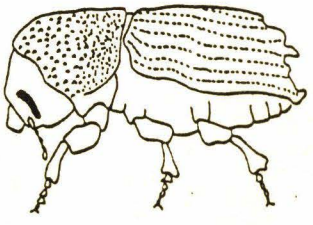

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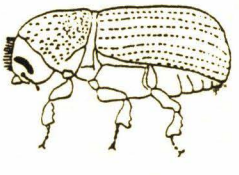

BARK BEETLE CONDITIONS
NORTHERN REGION
1987

by

Kenneth E. Gibson
and
Robert D. Oakes

Report 88-4

May 1988

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EXPERIMENT STATION

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BARK BEETLE CONDITIONS, NORTHERN REGION, 1987

INTRODUCTION

In the past few years, the mountain pine beetle infestations affecting lodgepole, ponderosa, whitebark/limber, and western white pine stands in the Northern Region have greatly overshadowed the impacts of other bark beetle species. While mountain pine beetle outbreaks are still of major consequence in host stands throughout the Region, overall affected acres continued a gradual decline that began several years ago. At the same time, infestations of other species of bark beetles grew to serious proportions in many parts of the Region in 1987. For that reason, we chose to report the status of all bark beetles, rather than just mountain pine beetle--as has been done for the past 3 years (Gibson and Oakes 1987, Tunnock et al. 1986, McGregor et al. 1985).

Brief summaries of all major pest species and their impacts are given in yearly Conditions Reports (Gibson et al. 1987, Stipe et al. 1987). We believe, however, there exists from time to time the need for a more in-depth report of important pests, such as bark beetles. These would detail where major infestations are located, what effects are being realized, and where possible, the predicted course of local outbreaks. Such is the intent of this report. Included are aerial and ground survey data for National Forests (plus lands of other ownerships where appropriate) on which bark beetle infestations currently exist. Tables and maps for 1986 and 1987 indicate infestation trends.

Not every infestation was surveyed, nor did we survey any as extensively as we would have liked. Time and personnel constraints precluded that. Therefore, survey data is pertinent only for those areas in which it was collected. Predictions of infestation trend for a certain area are based on observations of outbreak intensity and accompanying live-tree data. Where beetle population levels, outbreak history, and stand characteristics are similar, predictions may also apply.

MOUNTAIN PINE BEETLE

The series of outbreaks in the Northern Region, which continued to build during the late 1970's, reached their peak at more than 2.4 million acres infested in 1981. Since that time, while infestation impetus has shifted from one area to another, a gradual decline in total acres infested has occurred. In 1987, due in part to host depletion and management activities, the affected area was reduced to approximately 722,000 acres of all species on all ownerships. That is a significant reduction from the more than 943,000 acres in 1986. Still, some local infestations continued to increase--such as those on the Bitterroot, Idaho Panhandle, and Nez Perce National Forests (NF) and the Stillwater and Thompson River State Forests (SF) in Montana. Other smaller outbreaks in some reporting areas will undoubtedly intensify over the next few years; however, Regionwide we anticipate a continuing declining trend in the number of acres with infested trees in 1988.

Table 1 shows acres with infested trees, derived from aerial survey estimates for lands of Federal ownership. Table 2 shows corresponding figures for State and privately owned lands. Acreage figures are calculated from sketch-map estimates made during annual aerial surveys. Estimates of numbers of trees killed are based on the number of "faded" trees observed. Such esitmates are 1 year old by the time we receive them. In addition, depending on weather conditions in any particular year, it is sometimes difficult to distinguish year of kill from the air. So, as valuable as aerial survey estimates are, we strive to gather current-year infestation data through ground surveys. Ground surveys enable us to obtain up-to-date infestation levels as well as ones from the previous year. With those data, we are able to more accurately determine infestation trends. Green stand data collected at the same time help us better predict potential losses. In total, this information is used to obtain more accurate perceptions concerning vigor of infestations, brood survival rates, and anticipated impacts.

Table 1.--Acres under Federal jurisdiction in the Northern Region on which mountain pine beetle-caused mortality was aerially observed, 1986 and 1987.

Area	1986				1987			
	LPP 1/	PP	WBP	WWP	LPP	PP	WPB	WWP
BVHD NF	167	--	3	--	18	--	1	--
BTR NF	2,703	1,679	--	1	2,882	2,713	--	--
CLW NF	--	--	40	--	3	--	--	2
CUS NF	5	274	150	--	--	4	--	--
DLG NF	2,550	--	2	--	1,697	1	--	--
FLHD NF	229,621	509	1,246	1,128	181,149	757	551	767
GAL NF	6,481	--	538	--	455	--	--	--
HEL NF	2,433	937	--	--	305	403	18	--
IPNF's	58	34	23	2	455	90	--	44
KOOT NF	336,735	4,710	5	631	272,205	7,354	859	1,772
L&C NF	112	1,919	--	--	15	1,124	1	--
LOLO NF	34,966	877	849	39	23,973	736	43	3
NEZ NF	5,643	17	71	--	6,480	3	303	1
TOTAL NF	621,474	10,956	2,927	1,801	489,637	13,185	1,776	2,589
GLACIER NP	1,956	--	--	551	1,183	--	--	31
YELLOW-STONE NP	310	--	--	--	--	--	--	--
BLKFT IR	704	--	--	--	41	--	2	--
CROW IR	--	5,301	--	--	--	3,928	--	--
FLTHD IR	3,231	1,743	291	--	2,239	1,917	2-	--
FT. BLNP IR	--	15	--	--	--	--	--	--
N. CHEY IR	--	2,556	--	--	--	693	--	--
ROCKY BOY'S IR	355	593	--	--	24	17	--	--
BLM (Total)	3,998	2,163	--	--	3,668	750	--	--
TOTAL Non-NF	10,554	12,371	291	551	7,155	7,305	2	31
TOTAL FEDERAL	632,028	213,327	3,218	2,352	496,792	20,490	1,778	2,620

1/ LPP = LODGEPOLE PINE; PP = PONDEROSA PINE; WBP = WHITEBARK PINE; WWP = WESTERN WHITE PINE.

Table 2.--Acres of State and private ownership in the Northern Region on which mountain pine beetle-caused mortality was aerially observed, 1986 and 1987.

Area	1 9 8 6				1 9 8 7			
	LPP 1/	PP	WBP	WWP	LPP	PP	WPB	WWP
BVHD NF	--	--	--	--	6	--	--	--
BTR NF	5	3,324	--	--	1	2,361	--	--
CLW NF	--	--	--	--	--	--	--	--
CUS NF	1	25	272	--	--	--	--	--
DLG NF	218	5	--	--	300	--	--	--
FLHD NF	96,177	5,934	--	211	51,071	12,167	--	71
GAL NF	2,354	--	40	--	311	--	--	--
HEL NF	280	1,008	60	--	116	167	1	--
IPNF's	--	--	--	--	1	8	--	4
KOOT NF	77,254	3,788	--	230	36,040	3,180	127	--
L&C NF	128	2,851	--	--	106	191	--	--
LOLO NF	19,687	3,110	1	1	22,063	1,169	1	--
NEZ NF	286	--	--	--	963	--	--	--
STILL-WATER SF	51,212	101	885	1,617	58,717	630	420	--
SWAN R. SF	45	115	--	60	4	1	--	279
THOMP.R. SF	1,961	187	--	--	4,570	207	--	--
GARNETS	3	1,567	--	--	53	1,392	--	--
CATALDO FPD	500	--	--	--	--	--	--	--
CLW/POT. FPD	--	--	4	--	--	--	--	4
KENDRICK FPD	2	--	--	--	--	--	--	--
MICA FPD	--	2	--	--	--	--	--	--
W ST JOE FPD	51	--	--	--	--	--	--	1
CRAIG MTNS.	6,082	555	--	--	3,018	185	--	--
TOTAL	256,246	22,572	1,262	2,119	177,340	21,658	549	359

1/ LPP = LODGEPOLE PINE; PP = PONDEROSA PINE; WBP = WHITEBARK PINE; WWP = WESTERN WHITE PINE.

BEAVERHEAD NATIONAL FOREST

At one time one of the most heavily infested areas in the Region, the Beaverhead NF now harbors endemic populations only. Twenty-four acres of beetle-caused mortality were aerially detected in 1987 (Tables 1 and 2). Six small groups of lodgepole pine faders on the Wise River Ranger District (RD) had been recorded as mortality attributable to mountain pine beetles. Subsequent ground surveys showed actual mortality was caused by the combined effects of pine engraver beetles, comandra rust, dwarf mistletoe, and porcupines. In cooperation with Intermountain Station research entomologists, we monitored 20 pheromone-baited flight traps in susceptible lodgepole pine stands on the Wise River RD. We hoped to detect low-level beetle populations which might be present. No mountain pine beetles were collected.

BITTERROOT NATIONAL FOREST

A slight increase in number of acres with infested trees was noted in the Bitterroot reporting area in 1987. In 1986, 7,712 acres had infested trees. That increased to 7,597 acres in 1987 (Table 3). Most mortality in ponderosa pine stands is occurring in the East Fork and West Fork drainages of the Bitterroot River, and near Grouse Butte southwest of Darby. Virtually all lodgepole pine mortality is in the Frank Church-River of No Return Wilderness near Dennis Mountain, West Fork RD (figure 1).

Table 3.--Acres infested and trees per acre killed by mountain pine beetle, Bitterroot reporting area, 1986 and 1987.

		----- Acres infested 1/ -----		----- Avg. no. trees/acre killed 2/ -----			
Ownership	Host	1986	1987	Older	1986	1987	To date
Darby RD	LPP PP	0 942	0 2,191	0 18.2	10.0 36.9	0 56.7	10.0 111.8
Stevensville RD	LPP PP	0 25	0 0	-- --	-- --	-- --	-- --
Sula RD	LPP PP	13 459	0 377	-- 46.2	-- 46.7	-- 103.7	-- 196.6
West Fork RD	LPP PP	2,690 253	2,882 145	0 13.5	0 21.6	4.1 30.2	4.1 65.3
State, private, other	LPP PP	5 3,324	1 2,361	0 10.1	4.6 67.1	4.6 100.1	9.2 177.3
Total/ weighted avg.		7,711 3/	7,957	17.5	41.8	64.3	123.6

1/ Aerial survey estimates
2/ Ground survey data (averaged from number of stands visited)
3/ Total includes 1 acre of WWP

CUSTER NATIONAL FOREST

Sparsely scattered small groups of ponderosa pines killed by the beetle were observed in the Whitetail area, Ashland RD, in 1987. No other beetle-caused mortality was noted anywhere on the Forest (Tables 1 and 2). The infestation formerly in whitebark pine stands in the Pryor Mountains appears to have subsided.

DEERLODGE NATIONAL FOREST

Acres of lodgepole pine infested on the Forest continued to decline in 1987. The 2,697 acres affected in 1986 decreased to 2,000 in 1987 (figure 2). The majority of infested stands are on the Jefferson RD from Homestake Pass north to Delmoe Lake. Despite an overall decrease in infested acres, ground surveys conducted in that area showed a slight increase in trees per acre killed (Table 4). A localized infestation southeast of Butte in the Little Blacktail Creek drainage, Butte RD, had a significant increase in currently attacked trees in 1987. More than 44 trees per acre were killed. That infestation will likely continue for the next couple of years. Another distinct infestation, in the Little Boulder Creek area, Jefferson RD, declined in 1987.

Table 4.--Acres of lodgepole pine infested and trees per acre killed by mountain pine beetle, Deerlodge reporting area, 1986 and 1987.

	- - - - - Acres infested - - - - -		- - - - - Avg. no. trees/acre killed - - - - -			
Ownership	1986	1987	Older	1986	1987	To date
Butte RD	163	100	5.2	9.4	44.1	58.7
Deerlodge RD	108	0	--	--	--	--
Jefferson RD	2,132	1,596	6.0	31.7	31.9	69.6
Philipsburg RD	75	1	--	--	--	--
State, private, other	218	303	--	--	--	--
Total/ weighted average	2,696	2,000	6.0	29.8	32.9	68.7

FLATHEAD NATIONAL FOREST

Forestwide, the outbreak on National Forest and adjacent State and private lands is decreasing. Mortality in host stands of all species decreased from 339,458 acres in 1986 to 250,076 acres in 1987 (Table 5). Lodgepole pine stands infested decreased by more than 94,000 acres. Whitebark and western white pine stands showed similar decreases. Ponderosa pine stands on the Tally Lake RD followed that same trend; however, on the Swan Lake RD along the eastern shore of Flathead Lake, a fivefold increase in acres of ponderosa pine mortality was observed. On lands of other ownerships there was a significant increase in ponderosa pine mortality as well (figure 3).

Table 5.--Acres of host infested and lodgepole pine per acre killed by mountain pine beetle, Flathead reporting area, 1986 and 1987.

	- - - - - Acres infested - - - - -			- - - - - Avg. no. trees/acre killed - - - - -			
Ownership	Host	1986	1987	Older	1986	1987	To date
Glacier View RD	LPP	19,731	21,226	24.8	27.2	33.8	85.8
	WBP	670	543	--	--	--	--
	WWP	315	75	--	--	--	--
Hungry Horse RD	LPP	14,215	13,683	6.1	18.9	33.9	58.9
	WBP	531	3	--	--	--	--
	WWP	636	293	--	--	--	--
Spotted Bear RD	LPP	204	63	--	--	--	--
	WBP	43	5	--	--	--	--
	WWP	74	7	--	--	--	--
Swan Lake RD	LPP	22,386	27,810	47.3	37.5	13.3	98.1
	PP	149	757	--	--	--	--
	WBP	2	0	--	--	--	--
	WWP	103	392	--	--	--	--
Tally Lake RD	LPP	173,085	118,367	57.6	60.2	75.9	193.7
	PP	360	0	--	--	--	--
State, private, other	LPP	100,161	54,151	--	--	--	--
	PP	6,582	12,630	--	--	--	--
	WWP	211	71	--	--	--	--
Total/weighted average		339,458	250,076	16.8	24.8	33.6	75.2

GALLATIN NATIONAL FOREST

Beetle-caused mortality on the Forest continued its rapid decline in 1987. Only 766 acres are recorded as currently infested--down from 228,000 acres as recently as 1984, and more than one-half million acres in 1981. All mortality in 1987 was recorded in lodgepole pine stands, (Tables 1 and 2). Almost half of the total observed was on private land near Ibex Mountain north of Livingston. Small groups of faders were noted on Forest Service land in the Bridger Mountains north of Bozeman, the Crazy Mountains north of Livingston, and in the Yellowstone River drainage north of Gardiner.

HELENA NATIONAL FOREST

Whereas acreage affected by mountain pine beetles in all host species had increased in 1986 from 1985 levels, there were significant decreases in 1987. Forestwide only 421 acres of lodgepole pine, 572 acres of pondeorsa pine, and 19 acres of whitebark pine were recorded as currently infested (Table 6). The persistent infestation in the Deep Creek area, Townsend RD, decreased dramatically--from more than 2,300 acres in 1986, to fewer than 100 in 1987. Ground-survey data collected in that area confirmed the markedly declining trend. Average mortality for the areas sampled was six trees per acre in 1987; 50 trees per acre in 1986. Scattered ponderosa pine mortality occurred on the Helena and Lincoln RD's in the Dry Range north of Fort Logan, and west of the Smith River (figure 4).

Table 6.--Acres infested by mountain pine beetle, Helena reporting area, 1986 and 1987.

	- - - - - Acres infested - - - - -			- - - - - Avg. no. trees/acre killed - - - - -		
Ownership	LPP	PP	WBP	LPP	PP	WBP
Helena RD	5	368	0	236	401	0
Lincoln RD	42	499	0	3	2	1
Townsend RD	2,386	70	0	66		17
State, private, other	280	1,150	60	116	169	1
Total	2,713	2,087	60	421	572	19

IDAHO PANHANDLE NATIONAL FORESTS

Beetle infestations on the Forest, confined for the most part to the Boulder Creek drainage, Bonners Ferry RD, increased in 1987. In 1986, 58 acres showed faded lodgepole pines. Aerial survey estimates for 1987 indicated an increase to 413 acres (figure 5). Ground surveys likewise recorded infestation expansion--from 13.6 trees per acre killed in 1986 to 21.7 per acre killed in 1987 (Table 7). Much high-hazard lodgepole pine remains in the Boulder Creek area. Should conditions particularly conducive to the beetle coincide with failure to reduce stand susceptibility as planned, significant amounts of beetle-caused mortality could result.

Table 7.--Acres infested by mountain pine beetle, Idaho Panhandle reporting area, 1986 and 1987.

	- - - - - Acres infested - - - - -			- - - - - Avg. no. trees/acre killed - - - - -			
Ownership	LPP	PP	WBP	WWP	LPP	PP	WBP
Bonners Ferry RD	58	0	22	0	413	8	2
Fernan RD	0	34	1	1	0	2	14
Priest Lake RD	0	0	0	1	0	78	16
St. Maries RD	0	0	0	0	41	0	0
Wallace RD	0	0	0	0	1	2	12
State, private, other	0	0	0	0	1	9	4
Total	58	34	23	2	456	99	48

KOOTENAI NATIONAL FOREST

Although some areas, on lands of all ownerships--particularly south and east of Libby--continued to have beetle population buildups, Forestwide infested acreage declined by nearly 25 percent. Nearly 414,000 acres of lodgepole pine had been recorded as infested in 1986. That was reduced to slightly more than 308,000 acres in 1987. Ponderosa pine acreage, on the other hand, increased somewhat from 8,500 acres to 10,500 acres (Table 8). Much of that is also within a short distance of Libby, notably south of there, in the Wolf Creek drainage, and along either side of Lake Koocanusa. The population increases in lodgepole pine stands on the Fisher River, Libby, and Fortine RD's has slowed. The infestation on the northern portion of the Three Rivers RD (formerly Yaak RD) continued to decline except near Mount Henry where active infestations continue (figure 6).

Table 8.--Acres infested and trees per acre killed by mountain pine beetle, Kootenai reporting area, 1986 and 1987.

		----- Acres infested -----		----- Avg. no. trees/acre killed -----			
Ownership	Host	1986	1987	Older	1986	1987	To date
Cabinet RD	LPP	5,869	1,971	10.4	22.1	14.8	92.5
	PP	79	5	--	--	--	--
	WBP	5	5	3.0	2.2	0	5.2
	WWP	217	151	--	--	--	--
Fisher River RD	LPP	147,745	86,587	81.2	22.9	28.5	132.6
	PP	3,851	2,509	16.3	4.9	19.4	40.6
	WWP	0	29	--	--	--	--
Fortine RD	LPP	52,104	51,030	10.7	57.5	118.3	186.6
	PP	1	156	--	--	--	--
	WBP	0	828	--	--	--	--
Libby RD	LPP	60,253	56,523	6.8	45.6	34.6	87.0
	PP	754	4,682	11.6	29.3	30.5	71.5
	WBP	0	26	--	--	--	--
	WWP	206	465	--	--	--	--
Rexford RD	LPP	35,998	63,875	38.2	67.3	48.6	154.1
	PP	0	1	--	--	--	--
	WWP	32	326	--	--	--	--
Three Rivers RD (Troy)	LPP	942	1,586	--	--	--	--
	PP	25	1	--	--	--	--
	WWP	77	286	--	--	--	--
Three Rivers RD (Yaak)	LPP	33,824	10,633	37.7	9.3	13.2	59.5
	WWP	99	515	--	--	--	--
State, private, other	LPP	77,254	36,040	--	--	--	--
	PP	3,788	3,180	--	--	--	--
	WWP	230	127	--	--	--	--
Total/weighted average	LPP	413,989	308,245	41.1	24.5	31.0	131.2
	PP	8,498	10,534	14.5	14.7	23.8	53.0
Species total/ weighted avg.		423,353	321,537	43.5	26.1	34.3	137.5

LEWIS AND CLARK NATIONAL FOREST

Damage in lodgepole and ponderosa pine stands throughout the reporting area declined to 1,671 acres in 1987 (Table 9). Most ponderosa pine mortality occurred in the Judith River drainage, Judith RD; however, some was noted in the Belt Creek, Pilgrim Creek and Tenderfoot Creek drainages, Kings Hill RD, as well. Lodgepole pine stands in the Belt and Castle Mountains showed widely scattered damage. Ground surveys throughout the reporting area indicated generally declining beetle populations. Data from ponderosa pine stands averaged 10.1 trees per acre older mortality, 31.2 trees per acre killed in 1986, and 21.3 trees per acre killed in 1987. One lodgepole pine stand evaluated averaged 15.7 trees per acre killed in 1986; 10.3 trees per acre successfully attacked in 1987.

Two areas showing appreciable amounts of ponderosa pine mortality near the Lewis and Clark reporting area, but on lands administered by Bureau of Land Mangement are in the Red Hills south of Lewistown and the Little Rocky Mountains north of Zortman, (figures 7 and 13, respectively and Table 9).

Table 9.--Acres infested by mountain pine beetle, Lewis & Clark reporting area, 1986 and 1987.

	- - - - - Acres infested - - - - -		- - - - - Avg. no. trees/acre killed - - - - -		
Ownership	LPP	PP	LPP	PP	WBP
Judith RD	0	896	0	512	0
Kings Hill RD	72	498	0	333	1
Musselshell RD	40	525	15	279	0
BLM	10	1,346	2	233	0
State & Private	128	2,851	106	191	0
Total	250	6,116	123	1,548	1

LOLO NATIONAL FOREST

Total acres of all host species infested in the Lolo NF reporting area declined to just less than 50,000 in 1987. Trees on more than 61,000 acres had been infested in 1986 (Table 10). Beetle-caused damage in lodgepole pine decreased by more than 8,000 acres, while areas of ponderosa pine mortality declined by 2,200 acres (figures 8 and 9). Despite area-wide declines, some stands on the Plains/Thompson Falls and Ninemile RD's continued to experience significant amounts of new attacks in 1987. Ponderosa pine stands in the Garnet Mountains (for the most part BLM-administered lands) continued to experience widely scattered beetle-caused mortality.

Table 10.--Acres infested and trees per acre killed by mountain pine beetle, Lolo reporting area, 1986 and 1987.

		----- Acres infested -----		----- Avg. no. trees/acre killed -----			
Ownership	Host	1986	1987	Older	1986	1987	To date
Missoula RD	LPP	23	0	--	--	--	--
	PP	92	6	--	--	--	--
	WBP	10	0	--	--	--	--
Ninemile RD	LPP	926	487	20.7	19.9	45.2	85.8
	PP	490	266	12.4	14.6	31.9	58.9
	WWP	2	0	--	--	--	--
Plains RD	LPP	30,557	20,197	49.1	25.7	20.3	95.1
	PP	13	11	--	--	--	--
	WBP	2	0	--	--	--	--
	WWP	1	0	--	--	--	--
Seely Lake RD	LPP	9	19	--	--	--	--
	PP	4	83	--	--	--	--
	WBP	534	0	--	--	--	--
Superior RD	LPP	559	316	35.6	25.3	8.2	69.1
	PP	191	369	0	12.5	9.1	21.6
	WBP	0	1	--	--	--	--
	WWP	0	1	--	--	--	--
Thompson Falls RD	LPP	2,892	2,954	--	--	--	--
	PP	87	1	--	--	--	--
	WBP	301	42	--	--	--	--
	WWP	38	2	--	--	--	--
Garnet Mtns.	LPP	3	54	--	--	--	--
	PP	1,593	1,442	50.4	42.9	34.4	127.7
State, private, other	LPP	19,687	22,568	--	--	--	--
	PP	3,111	1,169	--	--	--	--
	WBP	1	1	--	--	--	--
	WWP	1	1	--	--	--	--
Total/weighted average	LPP	54,656	46,595	37.2	23.4	28.9	89.5
	PP	5,581	3,347	32.7	31.2	28.8	92.7
Species total/ weighted avg.		61,127	49,989	35.9	25.6	28.9	90.4

NEZ PERCE NATIONAL FOREST

The beetle epidemic recorded on the Forest and surrounding lands of other ownerships in the vicinity of Elk City and Red River since 1974 continued (figure 10). Number of trees infested near Elk City declined, while stands on the Red River RD and adjacent lands showed increased infested acres. Forestwide, acres showing beetle-caused mortality increased from more than 6,000 in 1986 to nearly 7,800 in 1987 (Table 11). Ground surveys confirmed declining trends near Elk City and an increasing trend near Red River (Table 11). More than 300 acres of whitebark pine were killed near John Day Mountain, Salmon River RD. Minor amounts of mortality in other host species, ponderosa pine and western white pine, were widely scattered Forestwide.

Table 11.--Acres infested and trees per acre killed by mountain pine beetle, Nez Perce reporting area, 1986 and 1987.

		----- Acres infested -----		----- Avg. no. trees/acre killed -----			
Ownership	Host	1986	1987	Older	1986	1987	To date
Clearwater RD	PP	1	1	--	--	--	--
Elk City RD	LPP	350	55	13.3	6.4	3.1	22.8
Red River RD	LPP PP WBP	5,293 2 1	6,425 0 0	36.5 0.8 --	11.3 7.3 --	15.7 0 --	63.5 8.1 --
Salmon River RD	PP WBP	14 70	1 303	-- 26.4	-- 6.1	-- 6.9	-- 39.4
Selway RD	PP WWP	0 0	1 1	-- --	-- --	-- --	-- --
State, private, other	LPP	290	994	--	--	--	--
Total/weighted average	LPP	5,933	7,474	30.7	10.0	12.6	53.3
Species total/ weighted avg.		6,021	7,781	30.3	10.4	11.9	52.6

GLACIER NATIONAL PARK

At one time one of the most extensive in the Region, the infestation in Glacier National Park (NP) is now nearly endemic. In 1987, only 1,224 acres were recorded as still infested (Table 1). Affected acres of lodgepole and western white pine stands are confined to tributaries of Bear Creek and the Middle Fork of the Flathead River. Most of the lodgepole pine groups are located between Lincoln and Harrison Creeks, while old-growth western white pine is being affected near Coal Creek. All beetle activity is in the Middle Fork of the Flathead River drainage along the southwestern boundary of the Park (figure 11).

YELLOWSTONE NATIONAL PARK

For the first time in more than 2 decades, no trees recently killed by beetles were recorded in the Park in 1987. Covering nearly 965,000 acres only 5 years ago, the once massive outbreak in Yellowstone NP has apparently ended. Though aerial and ground surveys conducted there in 1987 were limited, no trees killed in either 1986 or 1987 were observed.

BLACKFEET INDIAN RESERVATION

Always closely associated with the beetle outbreak in the eastern portion of Glacier NP, the infestation on the Blackfeet Indian Reservation (IR) continued its rapid decline in 1987. Only 41 acres of lodgepole pine mortality, mostly scattered along Otatso Creek, were observed (Table 1).

CROW INDIAN RESERVATION

Beetle-caused mortality in ponderosa pine stands in the Wolf Mountains east of Lodge Grass continued a gradual decline in 1987. The 5,301 acres recorded in 1986 were reduced to only 3,928 in 1987. Ground-collected data also showed a declining trend. In stands surveyed, an average 54.7 trees per acre were killed in 1986. New attacks in 1987 averaged 41.7 per acre (Table 12). Though the outbreak has killed a large number of trees in the past several years, and susceptible stands remain, an anticipated increase in local mill capacity should enable managers to harvest more infested and threatened stands.

NORTHERN CHEYENNE INDIAN RESERVATION

The infestation which had been building in the western portion of the Reservation along tributaries of Rosebud Creek declined in 1987. Though new attacks were observed in high numbers along the South Fork of Busby Creek and Sheep Gulch, overall infested acres observed from the air decreased from 2,556 in 1986 to 693 in 1987. While some infested areas were logged, there appears to have been a general reduction in beetle population. In the Dry Creek and South Fork Busby Creek drainages, nine blocks, ranging from 17 to 41 acres in size, were identified for a partial cut demonstration area. Extensive surveys in those areas revealed an average of only two new attacks per acre in one block and three per acre in another. No new attacks were observed in the other seven blocks. The infestation east of Lame Deer is reduced to widely scattered small groups of infested trees (figure 12).

FORT BELKNAP/ROCKY BOY'S INDIAN RESERVATIONS

Beetle outbreaks on both Reservations declined substantially in 1987 (Table 12). No beetle-caused mortality was observed on the Fort Belknap IR. On the Rocky Boy's IR, scattered mortality totaling 41 acres was noted in ponderosa pine stands south of Rocky Boy's Agency (figure 13).

Table 12.--Acres infested and trees per acre killed by mountain pine beetle, Indian Reservations in eastern Montana, 1986 and 1987.

		----- Acres infested -----		----- Avg. no. trees/acre killed -----			
Reservation	Host	1986	1987	Older	1986	1987	To date
Blackfeet	LPP	704	41	--	--	--	--
Crow	PP	5,301	3,928	10.6	54.7	41.7	107.0
Ft. Belknap	PP	15	0	--	--	--	--
N. Cheyenne	PP	2,556	693	23.8	24.5	50.3	98.6
Rocky Boy's	LPP/ PP	948	41	7.3	10.1	0	17.4

FLATHEAD INDIAN RESERVATION

The infestation on the Flathead IR has not changed markedly in the past few years. Ponderosa pine mortality attributed to mountain pine beetle increased slightly to 1,917 acres in 1987. In 1986, 1,743 acres were infested, while in 1985 1,923 infested acres were recorded (Table 13). Though ponderosa pine stands throughout the Reservation show some scattered faders, much of the concentrated mortality is located in the Hog Heaven area northwest of Elmo.

Beetle-caused mortality in lodgepole pine stands declined by a third in 1987--from 3,231 acres in 1986, to 2,239 acres. (Previously reported acreage figures for 1986 of 1,674 acres resulted from some data being erroneously recorded in an adjacent reporting area.) Infestations, though increasing slightly along the eastern shore of Flathead Lake and in the western part of the Reservation from Hot Springs to Rainbow Lake, have declined substantially in the northwest near Bassoo Peak (figure 14). Reservation-wide, new attacks declined in 1987 to an average 12.2 per acre (Table 13).

Table 13.--Acres infested and trees per acre killed by mountain pine beetle, Flathead Indian Reservation, 1986 and 1987.

	----- Acres infested -----			----- Avg. no. trees/acre killed -----		
Host	1986	1987	Older	1986	1987	To date
LPP	3,231	2,239	36.6	27.1	14.7	78.4
PP	1,743	1,917	12.9	28.9	8.0	49.8
WBP	291	2	--	--	--	--
Species total/ weighted avg.	5,265	4,158	27.7	27.7	12.2	67.6

STILLWATER, SWAN RIVER, THOMPSON RIVER STATE FORESTS (MONTANA)

The Stillwater State Forest experienced a small increase in infested acres, up to just less than 60,000 acres, in 1987 (Table 2). Most of those stands are lodgepole pine which have been experiencing beetle epidemics for a number of years. Because of its close proximity and similarity to stands on both Tally Lake and Glacier View RD's of the Flathead NF, we anticipate beetle populations will soon begin to decline.

Beetle-caused mortality on the Swan River State Forest remained light and scattered in 1987 (Table 2). Most affected stands were western white pine found along the Swan River.

Lodgepole pine stands on State-owned land in the Thompson River drainage (collectively known as Thompson River State Forest) showed a marked increase in mortality caused by mountain pine beetles. The 1,961 acres infested in 1986 increased to 4,570 acres in 1987 (Table 2). Another 207 acres of infested ponderosa pine stands were noted.

CATALDO, CLEARWATER/POTLATCH, KENDRICK, MICA, AND WEST ST. JOE FIRE PROTECTION DISTRICTS (IDAHO)

Mountain pine beetle-caused mortality, occurring almost exclusively in western white pine stands, remained light and scattered in the fire protection districts (FPD) surveyed. In 1987, a total of less than 10 acres on all districts combined was observed (Table 2).

CRAIG MOUNTAINS (IDAHO)

The infestation in the Craig Mountains, near Soldiers Meadow Reservoir, south of Lewiston, is finally declining. Having been recorded for nearly 10 years, it has killed most of the susceptible lodgepole and ponderosa pines in the area. Infested acres decreased by 50 percent in 1987--to slightly more than 3,200 acres (Table 2). Ground surveys confirmed this declining trend as most host stands have been severely depleted.

DOUGLAS-FIR BEETLE

Douglas-fir beetle populations, existing endemically in old-growth Douglas-fir stands affected by root disease, defoliation, overstocking, drought, or any combination of weakening agents, can be found throughout the range of their host. From time to time, populations reach epidemic proportions as a result of stand disturbances which create conditions particularly conducive to beetle attraction and brood survival. Such was apparently the case in northern Idaho about 1985 or 1986. In retrospect, we surmise there was likely a large amount of blowdown, albeit scattered, which went undetected. That, and the abnormally dry weather experienced for the past several years, produced conditions which resulted in dramatic increases in Douglas-fir beetle-caused mortality.

In 1986, slightly more than 4,200 acres were recorded as having aerially observable Douglas-fir mortality attributed to Douglas-fir beetle (Table 14). More than one quarter of that, however, was on the Nez Perce NF alone. That infestation had been ongoing for several years and, coincidentally, declined markedly in 1987. Elsewhere in northern Idaho, particularly the Idaho Panhandle and Clearwater NF's as well as several State-administered fire protection districts, incidence of observable Douglas-fir mortality increased fivefold over 1986 levels (figures 15 and 16). Of the total 15,517 acres recorded in 1987 in the Region, 15,240 acres were in northern Idaho (Table 14).

Table 14.--Acres infested and mortality attributed to Douglas-fir beetle in the Northern Region, by reporting area, 1986 and 1987.

	----- Acres infested -----			----- Avg. no. trees/acre killed -----		
Reporting Area	Acres	Trees	Vol. (MBF)	Acres	Trees	Vol. (MBF)
Beaverhead NF	160	197	39.4	--	--	--
Bitterroot NF	583	460	92.0	14	126	25.2
Idaho Panhandle NF	34	167	58.4	7,694	13,843	4,845.0
Clearwater NF	35	165	57.7	3,787	10,286	3,600.1
Custer NF	6	17	3.4	1	3	0.6
Deerlodge NF	1	2	0.4	1	2	0.4
Flathead NF	612	457	91.4	3	29	5.8
Gallatin NF	200	110	22.0	1	3	0.4
Helena NF	12	30	6.0	4	10	2.0
Kootenai NF	--	--	--	2	6	1.2
Lewis & Clark NF	--	--	--	1	5	0.6
Lolo NF	349	457	91.4	108	220	44.0
Nez Perce NF	1,142	1,554	543.9	91	414	144.9
Glacier NP	3	10	2.0	--	--	--
Nez Perce IR	--	--	--	1	5	0.4
Flathead IR	271	345	69.0	126	143	28.6
Rocky Boy's IR	1	1	0.2	1	3	0.4
Thompson River SF	2	15	3.0	--	--	--
Priest Lake FPD	--	--	--	134	1,325	463.8
Pend Oreille FPD	--	--	--	60	560	196.0
Mica FPD	20	40	14.0	2,352	14,105	4,936.7
Cataldo FPD	--	--	--	100	145	50.8
W. St. Joe FPD	345	610	213.5	282	965	337.7
Kendrick FPD	1	10	3.5	3	25	8.8
Clearwater/Pot. FPD	298	1,228	429.8	673	3,249	1,137.1
Maggie Cr. FPD	140	325	113.7	29	234	81.9
Craig Mtns.	22	56	19.6	35	132	46.2
Garnets (BLM)	29	32	6.4	14	34	6.8
Total	4,266	6,288	1,880.7	15,517	45,871	15,967.3

This series of infestations is concentrated in a portion of northern Idaho roughly from Potlatch to just north of Sandpoint. On the southern portion of the Idaho Panhandle NF--specifically the Wallace and Fernan RD's--can be found 70 percent of the Forest's nearly 7,700 infested acres. The Clearwater NF contains almost 3,800 acres of beetle-killed trees--most on the Palouse and Canyon RD's. The reporting area with the next highest total of infested Douglas-fir stands is the Mica Fire Protection District. With more than 2,300 infested acres, the expansive District encompasses the entire western half of Kootenai County.

Ground surveys conducted in several locations throughout the infested area indicated many infestations have peaked and will likely decline in 1988. A number of them were lower in 1987 than in 1986. Ground data from northern Idaho was collected at four sites along the St. Joe River between St. Maries and just east of Avery. At only one spot did it appear populations were still rising. Eight stands were ground checked in the vicinity of Coeur d'Alene--at only two were new attacks more numerous in 1987 than in 1986. Two distinct areas on the Clearwater NF were surveyed. Three sites along the North Fork of the Clearwater River near Canyon Work Center showed still-increasing populations. Two of three others along the North Fork of the Palouse River, east of Potlatch, indicated decidedly declining numbers of new attacks. Likewise, two of three areas checked north of Priest River also recorded lower beetle populations in 1987.

In summary, we believe that for much of the infested area in northern Idaho, outbreak intensity will lessen in 1988. Unless winter blowdown or a continuation of extremely dry weather provides favorable colonization sites for the beetle, populations should return to more normal levels in the next year or so.

In western Montana, stands harboring Douglas-fir beetle outbreaks generally declined in 1987. On a few Forests, isolated infestations remain. These few are typically associated with root disease-weakened trees. Barring unusual stand disturbances, we don't anticipate major outbreaks in 1988.

PINE ENGRAVER

The abnormally dry conditions previously discussed have produced conditions on various sites and in several host species that are unusually conducive to population buildups of insect opportunists. Notable examples are the increasing amounts of top kill and whole-tree mortality in second-growth ponderosa pine stands caused by pine engraver beetles (figure 17). In northern Idaho, particularly during the past 2 to 3 years, significant increases in damage attributed to this pest have been recorded. In 1976, only 825 acres, on which scattered mortality was observed, were noted. By 1987, infested acres totaled more than 1,500 and an estimated 10,200 trees were killed. Often associated with storm damage during the winter, or accumulations of slash and logging residues, outbreaks of pine engravers are usually easily controlled. However, current epidemics more related to drought-stressed trees will likely continue until normal amounts of precipitation are realized in infested and susceptible stands.

Though similar weather patterns have existed over much of Montana for a few years, lodgepole and ponderosa pine stands in the State have not experienced serious pine engraver beetle outbreaks. Some scattered mortality has been noted, principally in the Blackfoot River drainage and Garnet Mountains. A larger population expansion was recorded on the Flathead IR in the vicinity of Hog Heaven where logging slash was left untreated. As a result, standing-tree mortality was observed to some extent over a total of 378 acres.

FIR ENGRAVER

While no areas of grand fir mortality, attributed to fir engraver beetles, were observed in Montana in 1987, widely scattered groups covered more than 2,200 acres in northern Idaho (figure 18). More than 9,600 trees were killed. Though typically associated with root disease-weakened trees, the drought stress we have experienced has considerably exacerbated an already chronically serious problem. As long as dry conditions remain, significant losses to the fir engraver/root-disease complex in grand fir stands can be expected.

WESTERN PINE BEETLE

Increasing populations of western pine beetle in second-growth ponderosa pine stands in northern Idaho and western Montana are also a result of abnormally dry weather. More typically associated with decadent, over mature ponderosa pines, the beetles are attacking younger, usually overstocked stands, which have been weakened by reduced amounts of moisture. In 1987, more than 1,300 trees were killed on a total of about 460 acres (figure 19). One group in the Craig Mountains south of Lewiston, Idaho, totaled nearly 900 trees killed and extended to 306 acres. On the Nez Perce IR several groups of second-growth ponderosa pine stands southeast of Orofino were infested. In addition to the tree mortality attributed to western pine beetle, we suspect that some recorded as mortality caused by pine engravers may, in fact, have been killed by a complex of beetles of which the western pine beetle was a part.

SPRUCE BEETLE

Since 1984, when major spruce beetle outbreaks in western Montana and northern Idaho were brought under control, incidence of beetle-caused mortality in old-growth spruce stands has declined dramatically. In 1987, only a few isolated faders were observed. On the Beaverhead NF, a few beetle-killed trees were noted along the West Fork of the Madison River. Aerial surveys revealed less than 10 scattered spruce killed along a tributary of the Selway River on the Bitterroot NF in Idaho. Finally, several small groups of faders, totaling less than 40 trees, were recorded along Hungry Horse Reservoir on the Flathead NF.

WESTERN BALSAM BARK BEETLE

Periodically, large amounts of subalpine fir mortality are recorded in our Region. Though quite likely a complex of pests including root diseases and other bark beetles, the major contributor to this mortality is the western balsam bark beetle. As recently as 1984, affected stands totaled more than 13,000 acres; however, fewer than 1,000 trees were killed on less than 500 acres in 1987. In Yellowstone NP, several groups totaled 227 acres with approximately 125 dead trees. The remainder was widely scattered in high-elevation subalpine fir stands Regionwide.

ACKNOWLEDGEMENT

We thank members of the Pest Management staff for their assistance in data collection and ground checking many beetle-infested groups. Specifically, we appreciate the efforts of Larry Stipe, Wayne Bousfield, Sandy Gast, Hubert Meyer, Lionel Hall, Jeff Padgett, and Tim Williams. Without the hours they spent and the miles they covered, our knowledge of bark beetle "conditions" would be significantly less. A special thanks goes to Mal Furniss, Forest Service research entomologist (retired), who helped assess the Douglas-fir beetle outbreak on the Palouse RD, Clearwater NF.

REFERENCES

Gibson, K. E., S. K. Hagle, and S. Kohler. 1987. Montana forest pest conditions and program highlights, 1986. USDA Forest Serv., North. Reg./Montana Dept. of State Lands. FPM Report 87-2. 29 pp.

Gibson, K. E. and R. D. Oakes. 1987. Mountain pine beetle status report, Northern Region, 1986. USDA Forest Serv. North. Reg. FPM Report 87-7. 37 pp.

McGregor, M. D., K. E. Gibson, S. Tunnock, L. E. Stipe, H. E. Meyer, and R. D. Oakes. 1985. Status of mountain pine beetle infestations, Northern Region, 1984. USDA Forest Serv. North. Reg. FPM Report 85-25. 57 pp.

Tunnock, S., M. D. McGregor, R. D. Oakes, and H. E. Meyer. 1986. Mountain pine beetle infestations in the Northern Region during 1985. USDA Forest Serv. North. Reg. FPM Report 86-9. 47 pp.

Stipe, L. E., R. L. James, R. L. Livingston, J. W. Schwandt, D. P. Beckman, K. A. Knapp, J. Hoffman, and J. Weatherby. 1987. Idaho forest pest conditions and program summary, 1986. USDA Forest Service, Northern and Intermountain Regions/Idaho Dept. of Lands. FPM Report 87-1. 32 pp.

APPENDIX

SCIENTIFIC NAMES

Beetles

Mountain pine beetle	*Dendroctonus ponderosae* Hopkins
Douglas-fir beetle	*Dendroctonus pseudotsugae* Hopkins
Pine engraver	*Ips pini* Say
Fir engraver	*Scolytus ventralis* LeConte
Western pine beetle	*Dendroctonus brevicomis* LeConte
Spruce beetle	*Dendroctonus rufipennis* (Kirby)
Western balsam bark beetle	*Dryocoetes confusus* Swaine

Hosts

Lodgepole pine	*Pinus contorta* var. *latifolia* Engelmann
Ponderosa pine	*Pinus ponderosa* Laws.
Western white pine	*Pinus monticola* Douglas
Whitebark pine	*Pinus albicaulis* Engelmann
Limber pine	*Pinus felxilis* James
Douglas-fir	*Pseudotsuga menziesii* var. *glauca* (Beissn.) Franco
Grand fir	*Abies grandis* (Douglas) Lindl.
Subalpine fir	*Abies lasiocarpa* (Hook.) Nutt.
Engelmann spruce	*Picea engelmannii* Parry

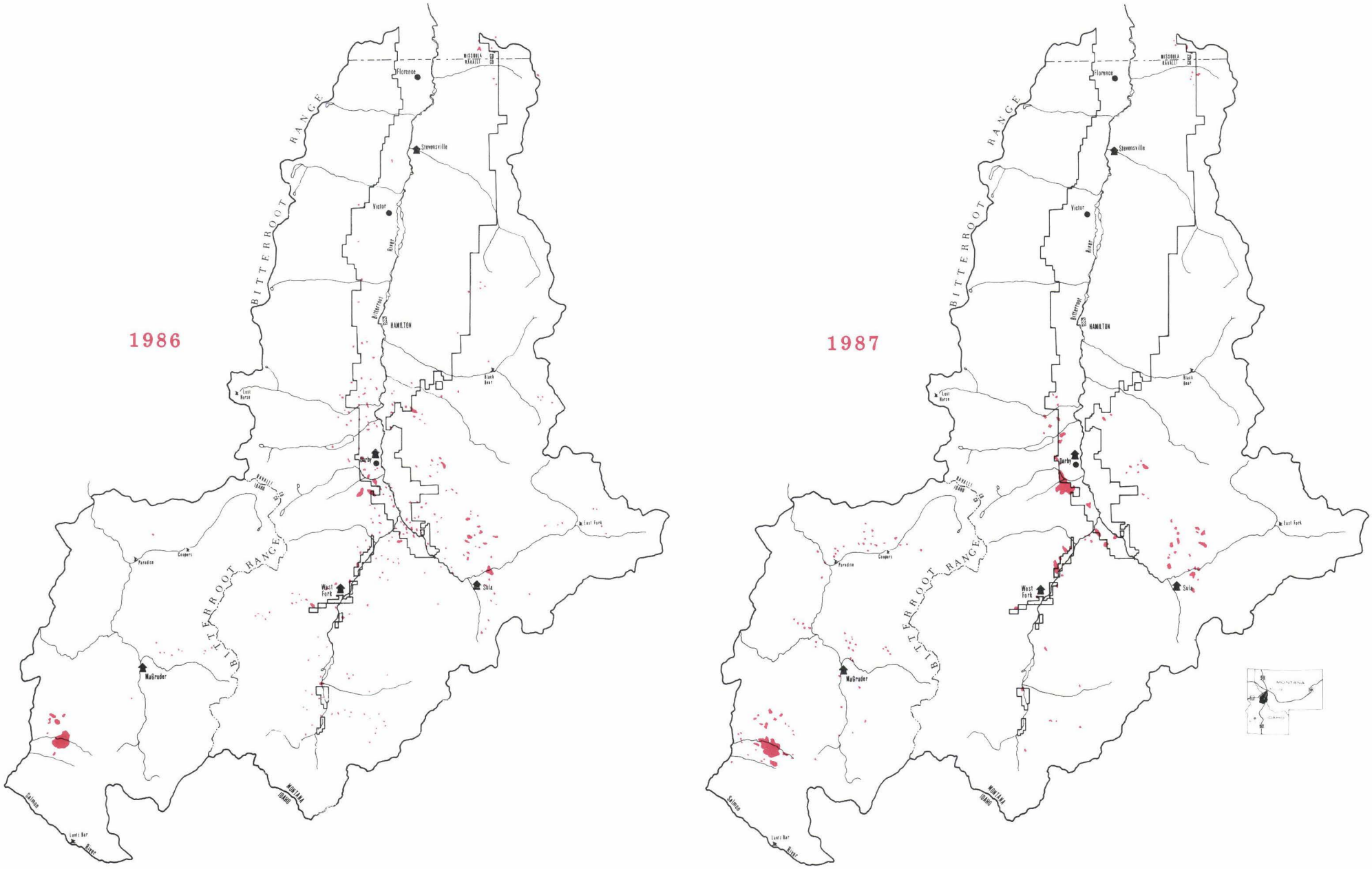

Figure 1.--Areas of pines infested by mountain pine beetle, Bitterroot National Forest area, Montana and Idaho.

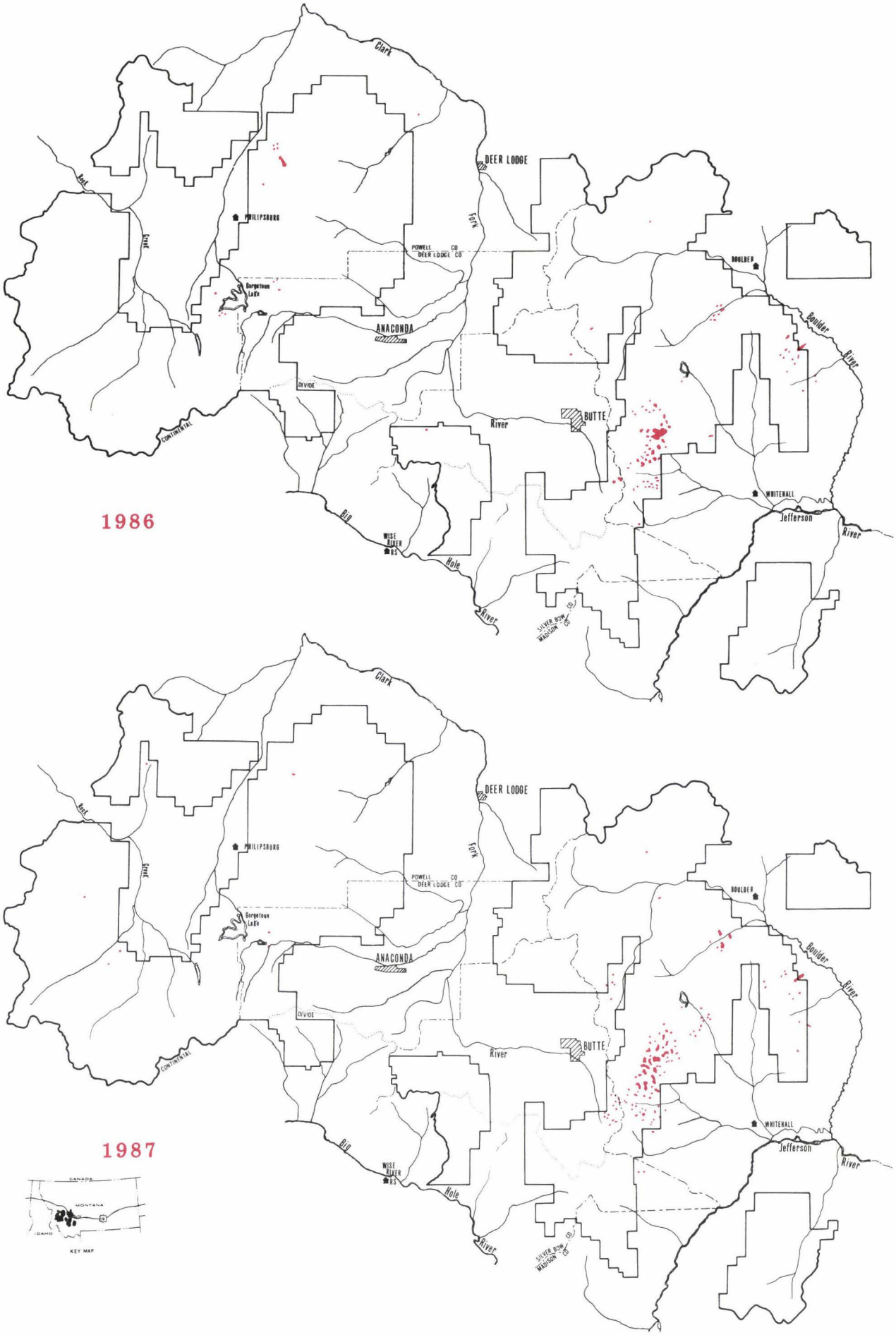

Figure 2.--Areas of pines infested by mountain pine beetle, Deerlodge National Forest area, Montana.

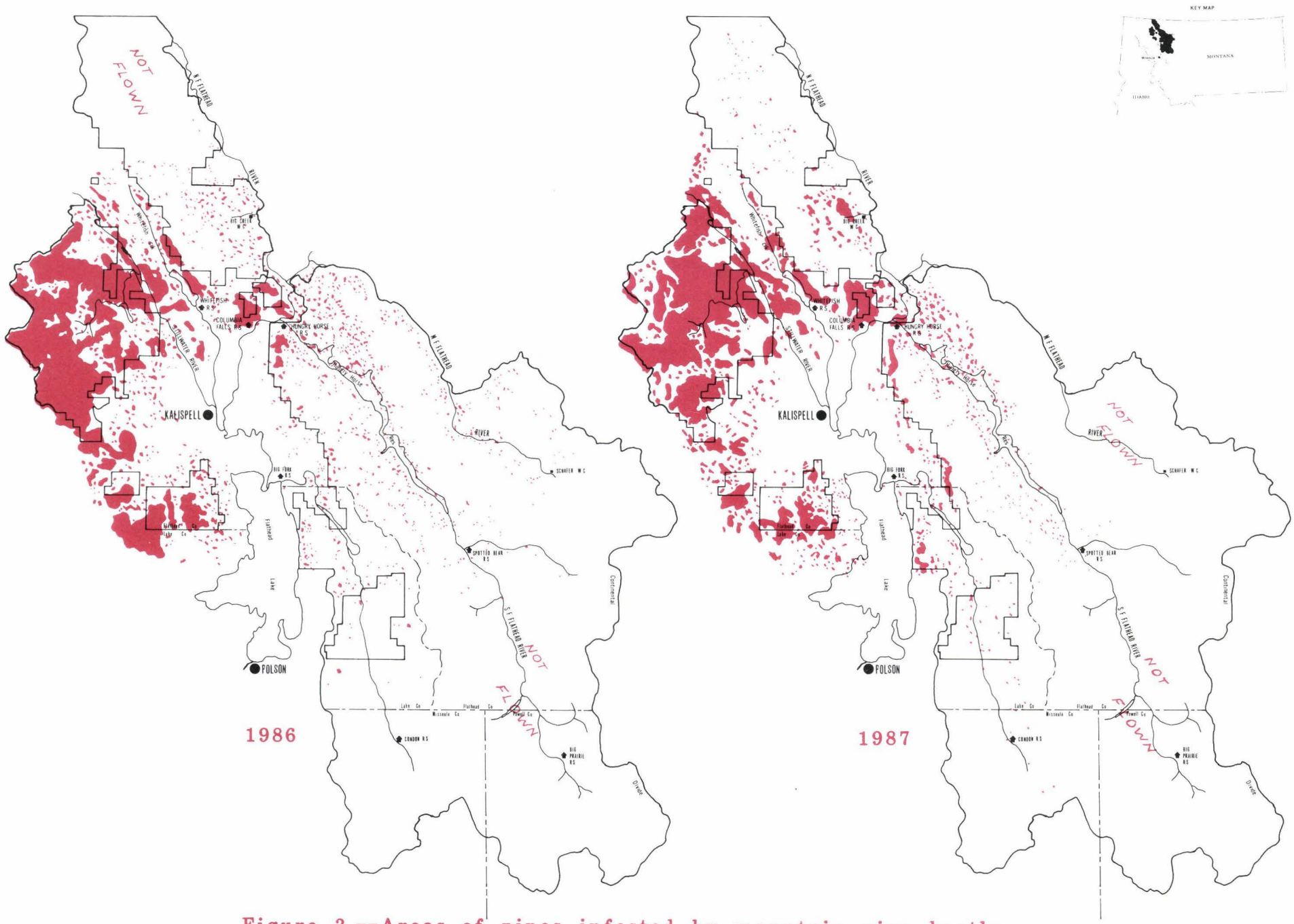

Figure 3.--Areas of pines infested by mountain pine beetle, Flathead National Forest area, Montana.

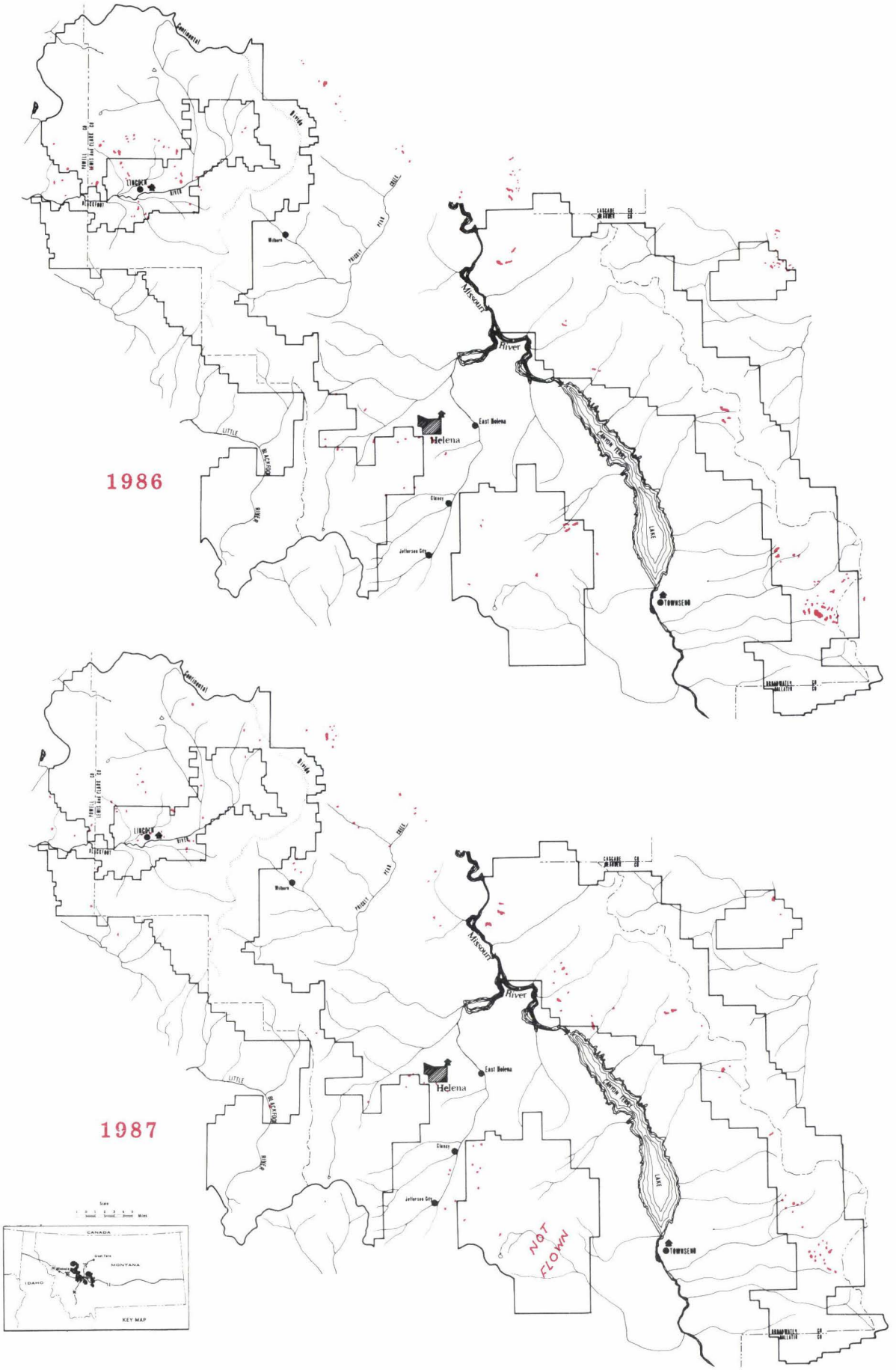

Figure 4.--Areas of pines infested by mountain pine beetle, Helena National Forest area, Montana.

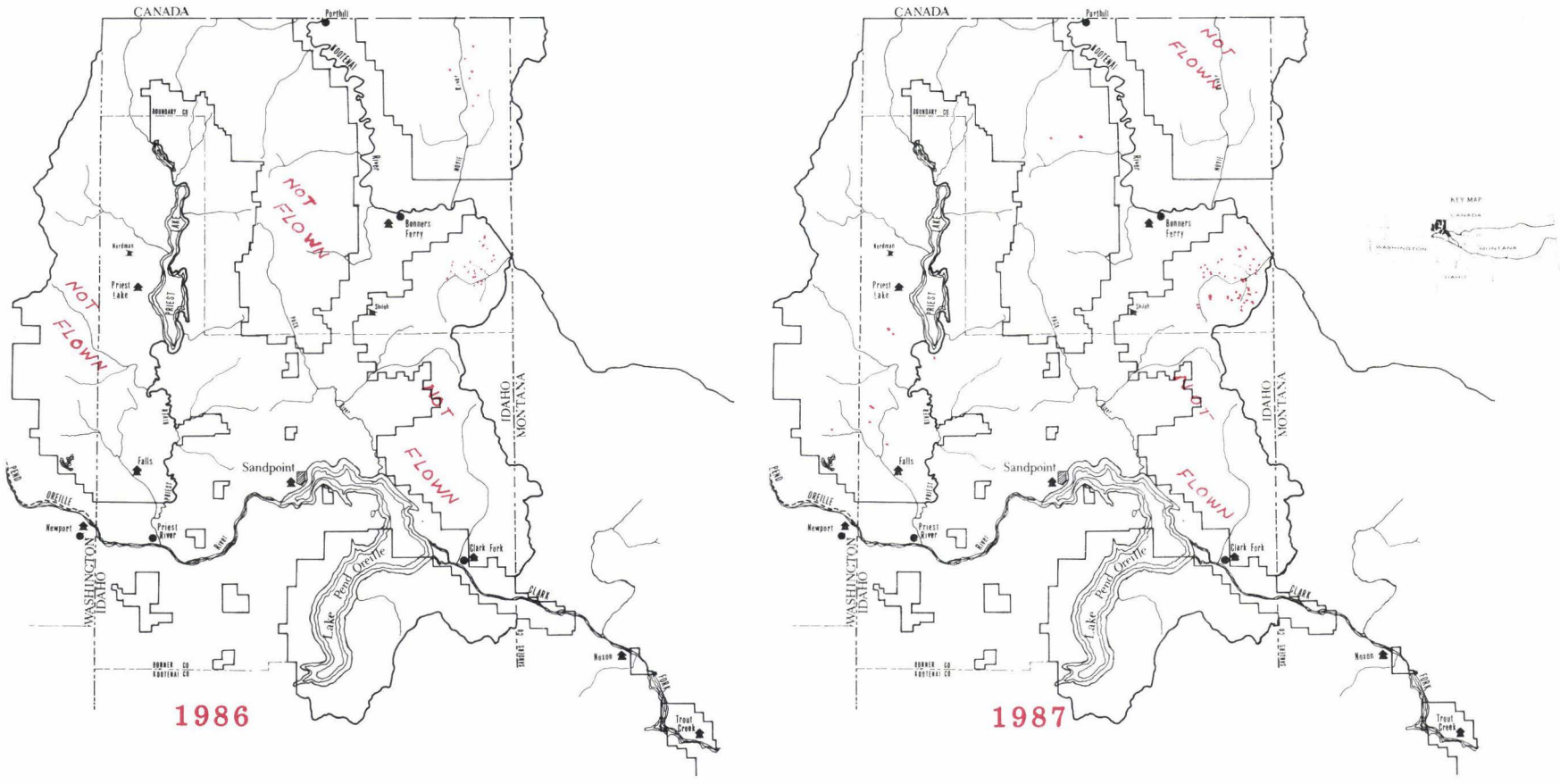

Figure 5.--Areas of pines infested by mountain pine beetle, Idaho Panhandle National Forests (Kaniksu NF) area, Idaho.

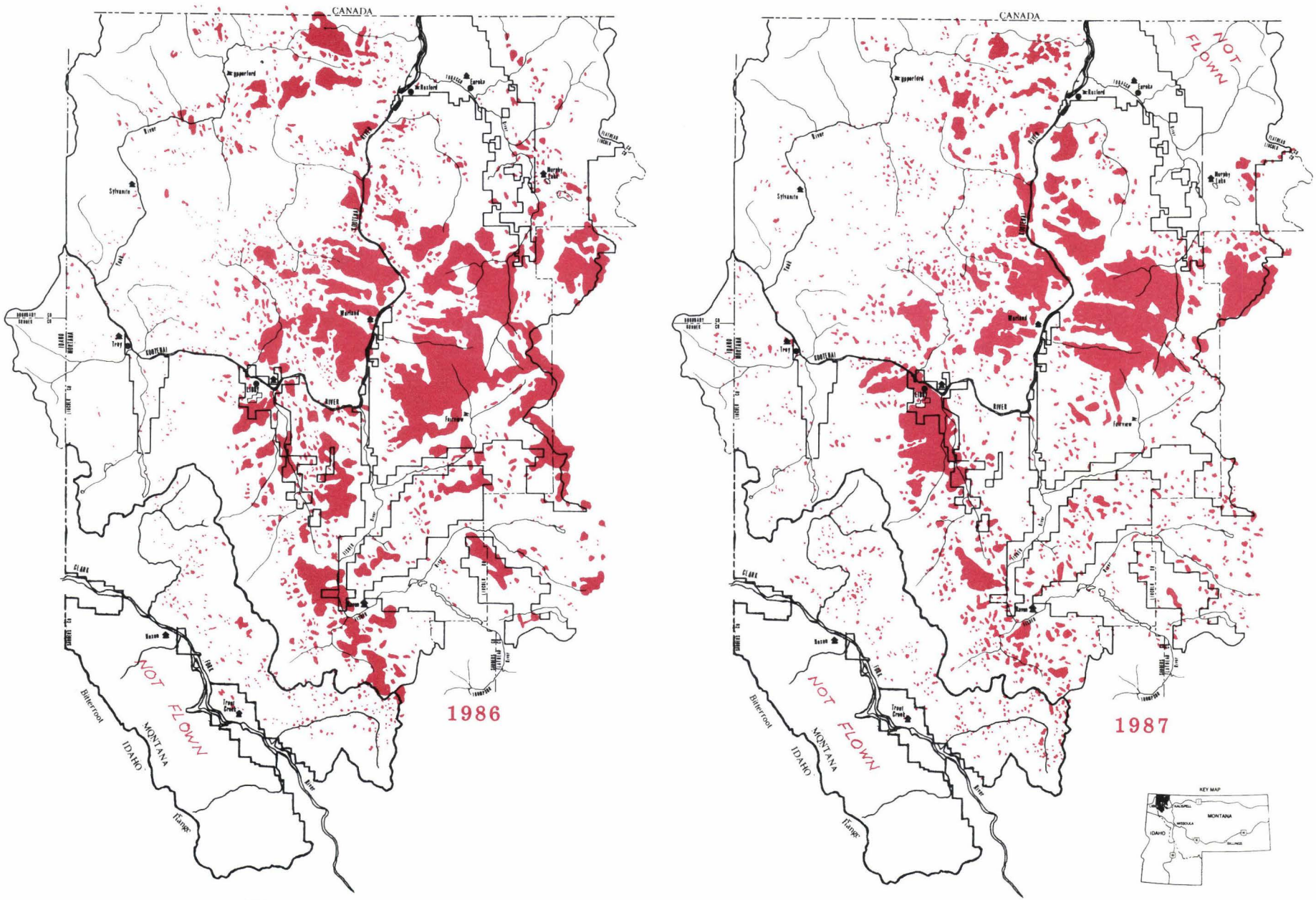

Figure 6.--Areas of pines infested by mountain pine beetle, Kootenai National Forest area, Montana.

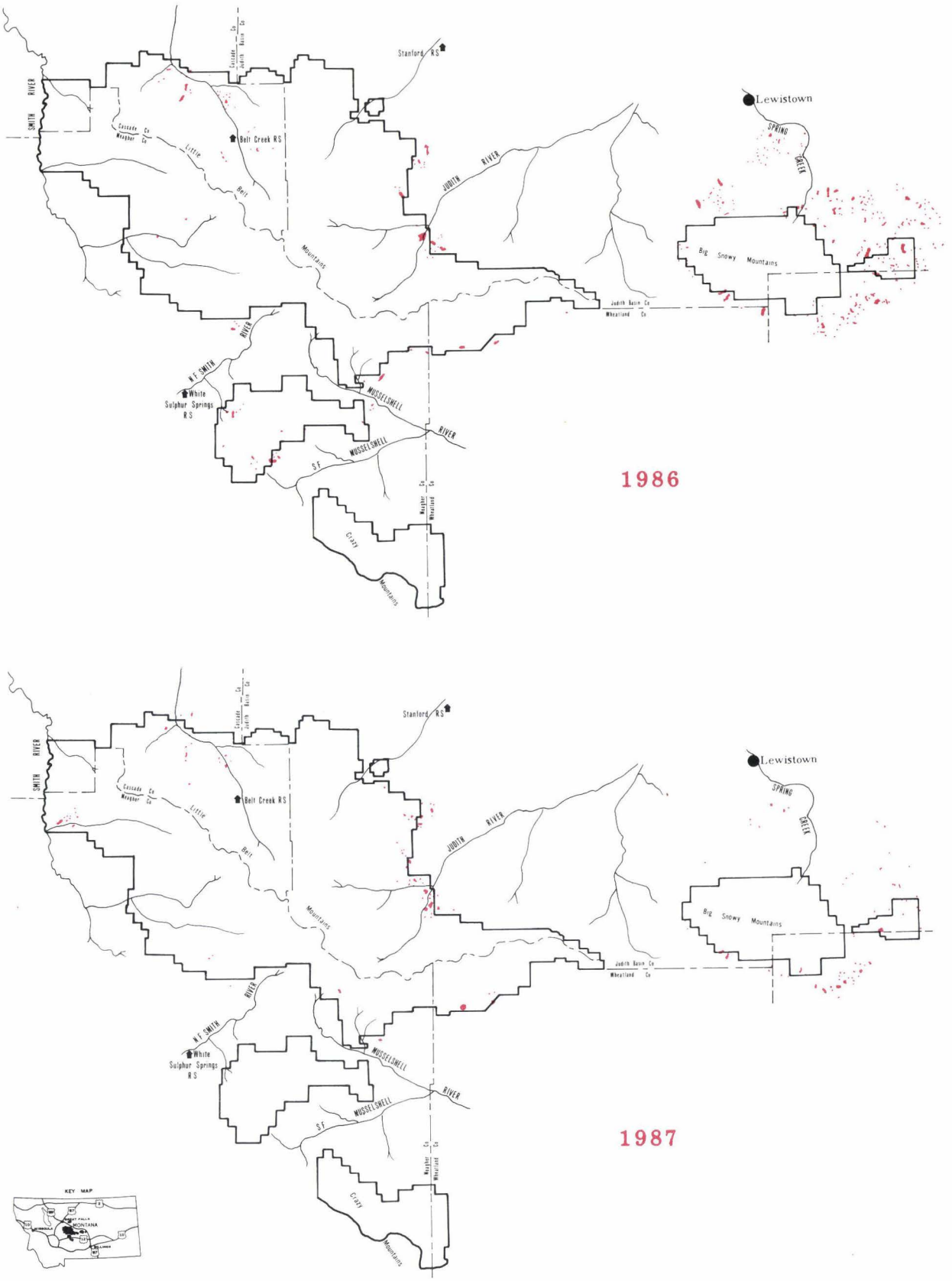

Figure 7.--Areas of pines infested by mountain pine beetle, Lewis & Clark National Forest area, Montana.

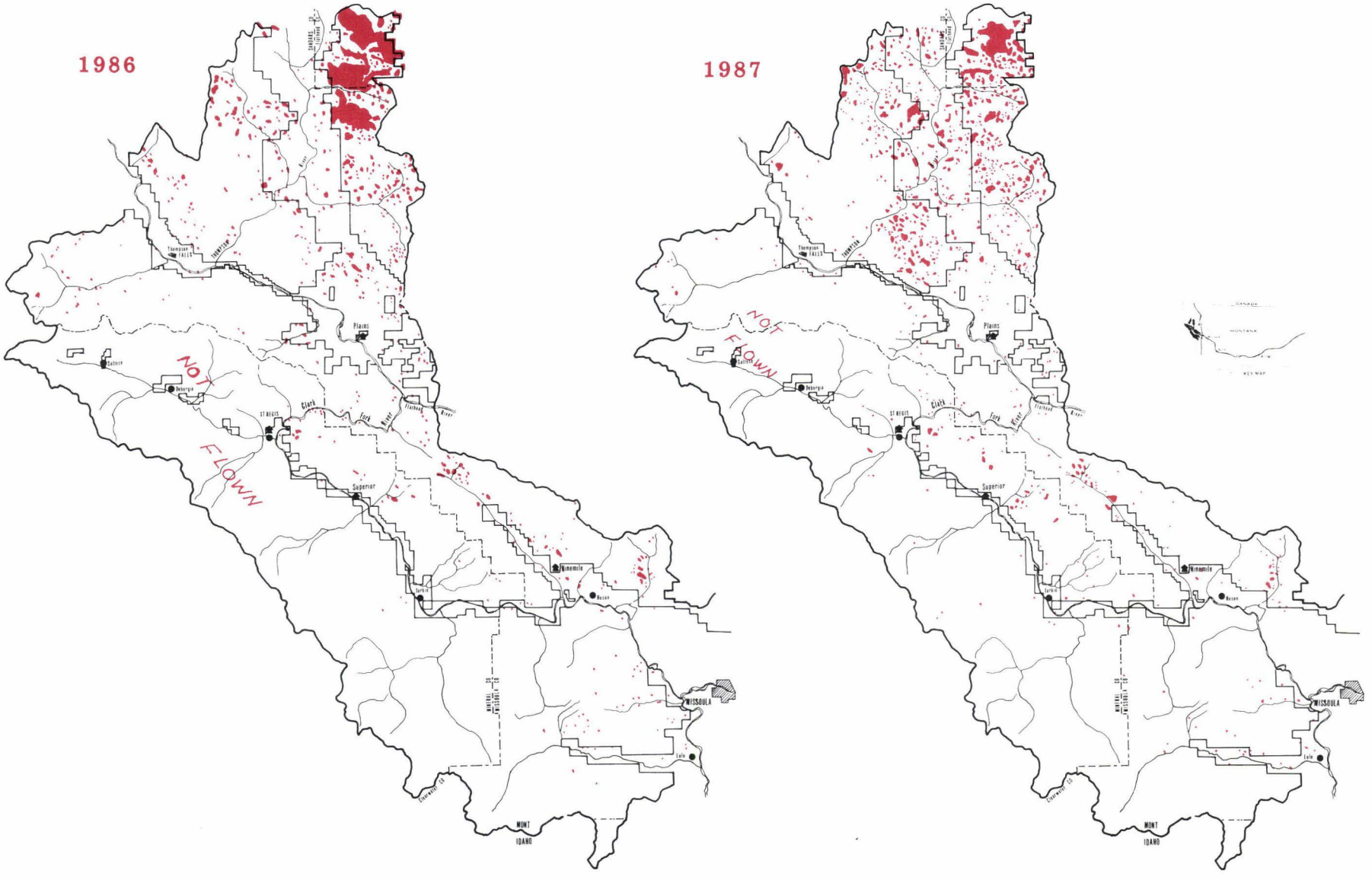

Figure 8.--Areas of pines infested by mountain pine beetle, Lolo National Forest area(west half), Montana.

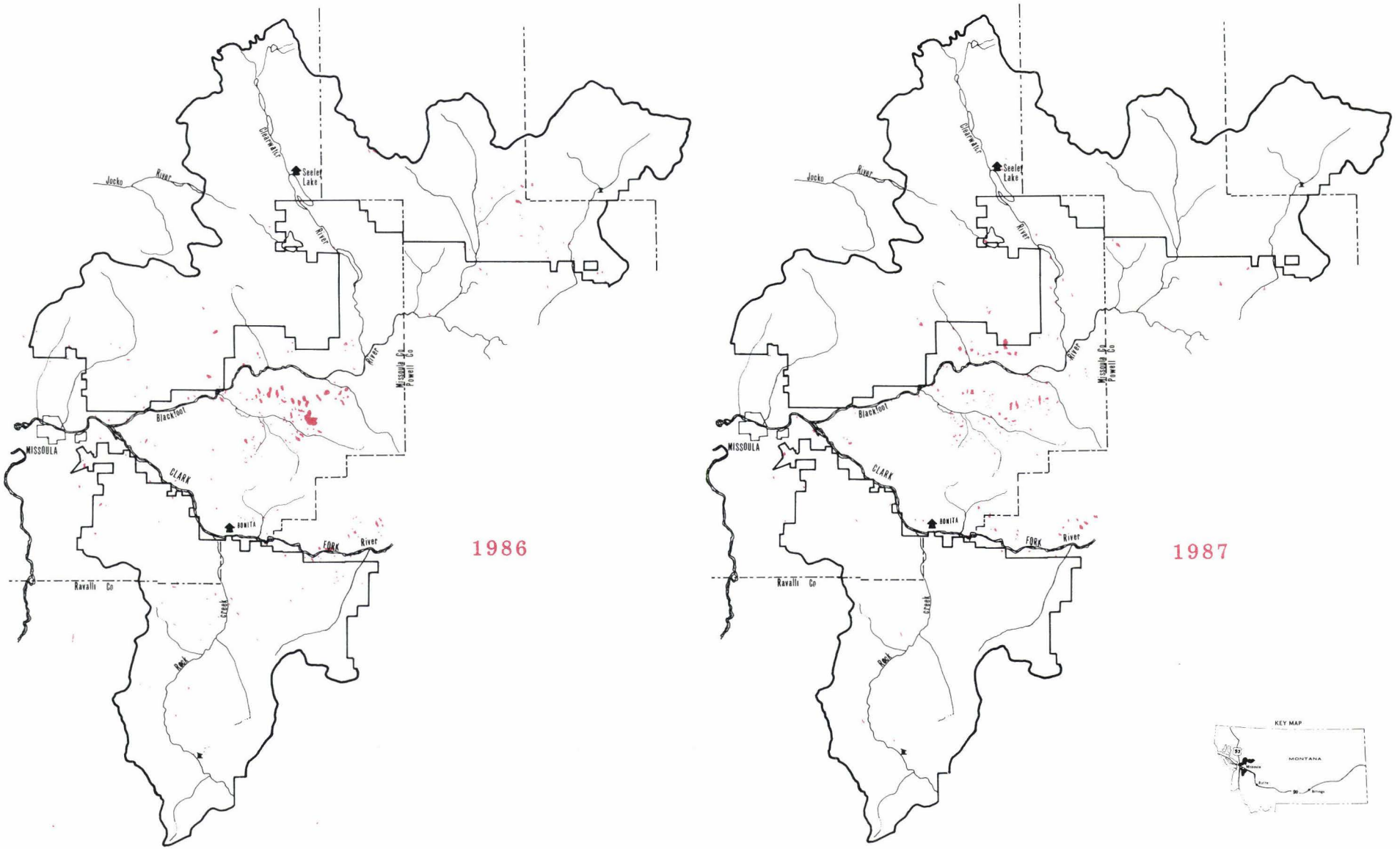

Figure 9.--Areas of pines infested by mountain pine beetle, Lolo National Forest area(east half), Montana.

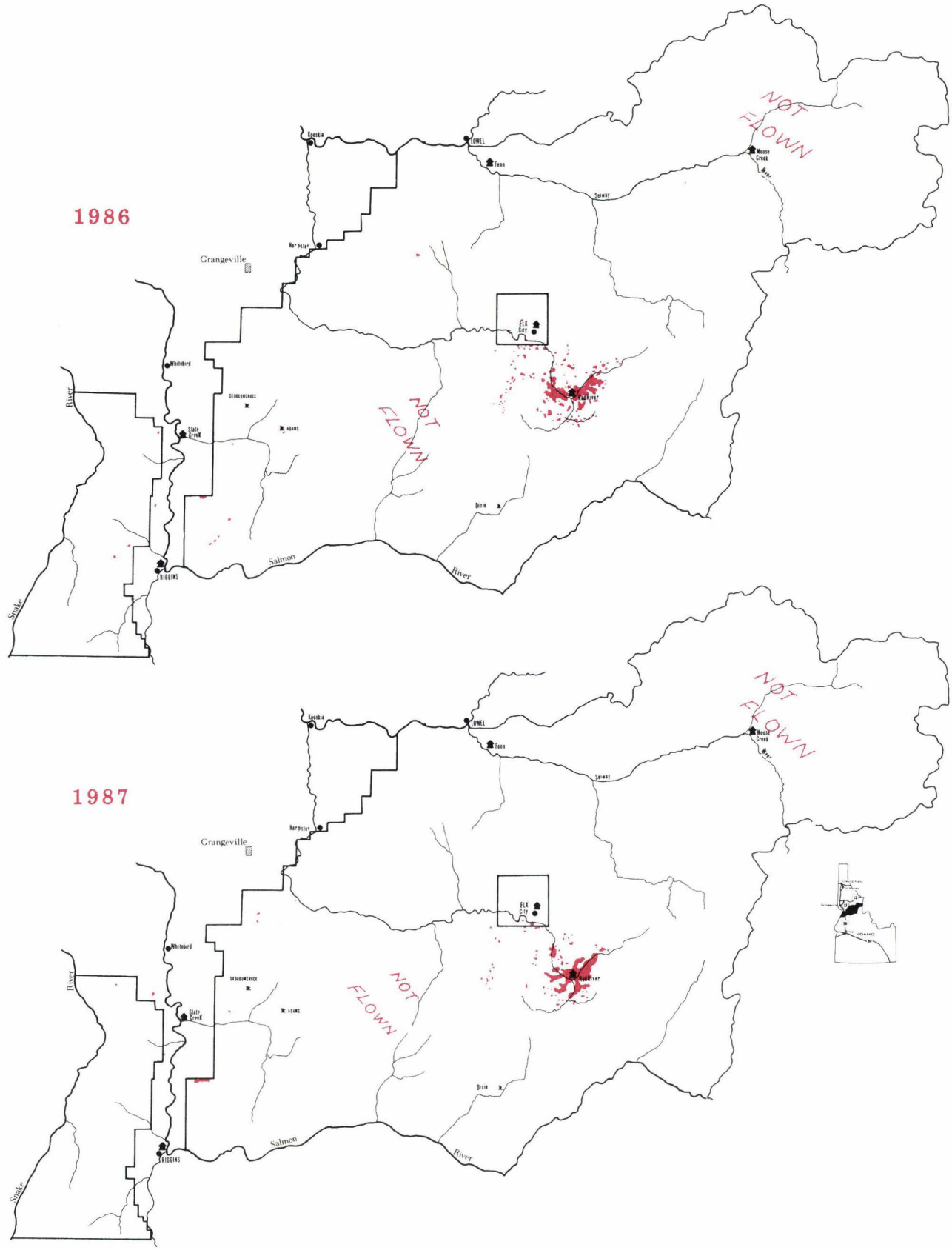

Figure 10.--Areas of pines infested by mountain pine beetle, Nezperce National Forest area, Idaho.

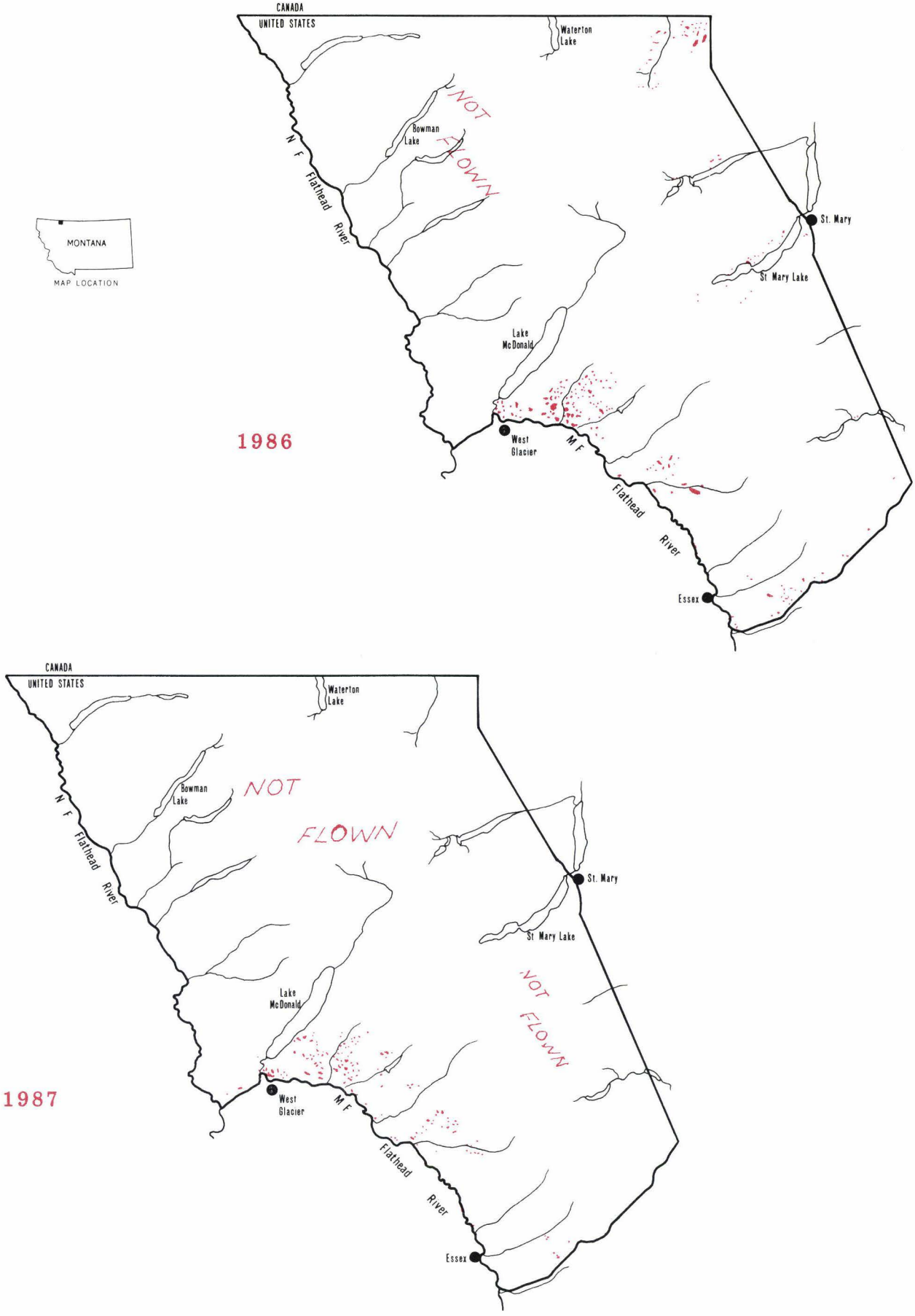

Figure 11.--Areas of pines infested by mountain pine beetle, Glacier National Park, Montana.

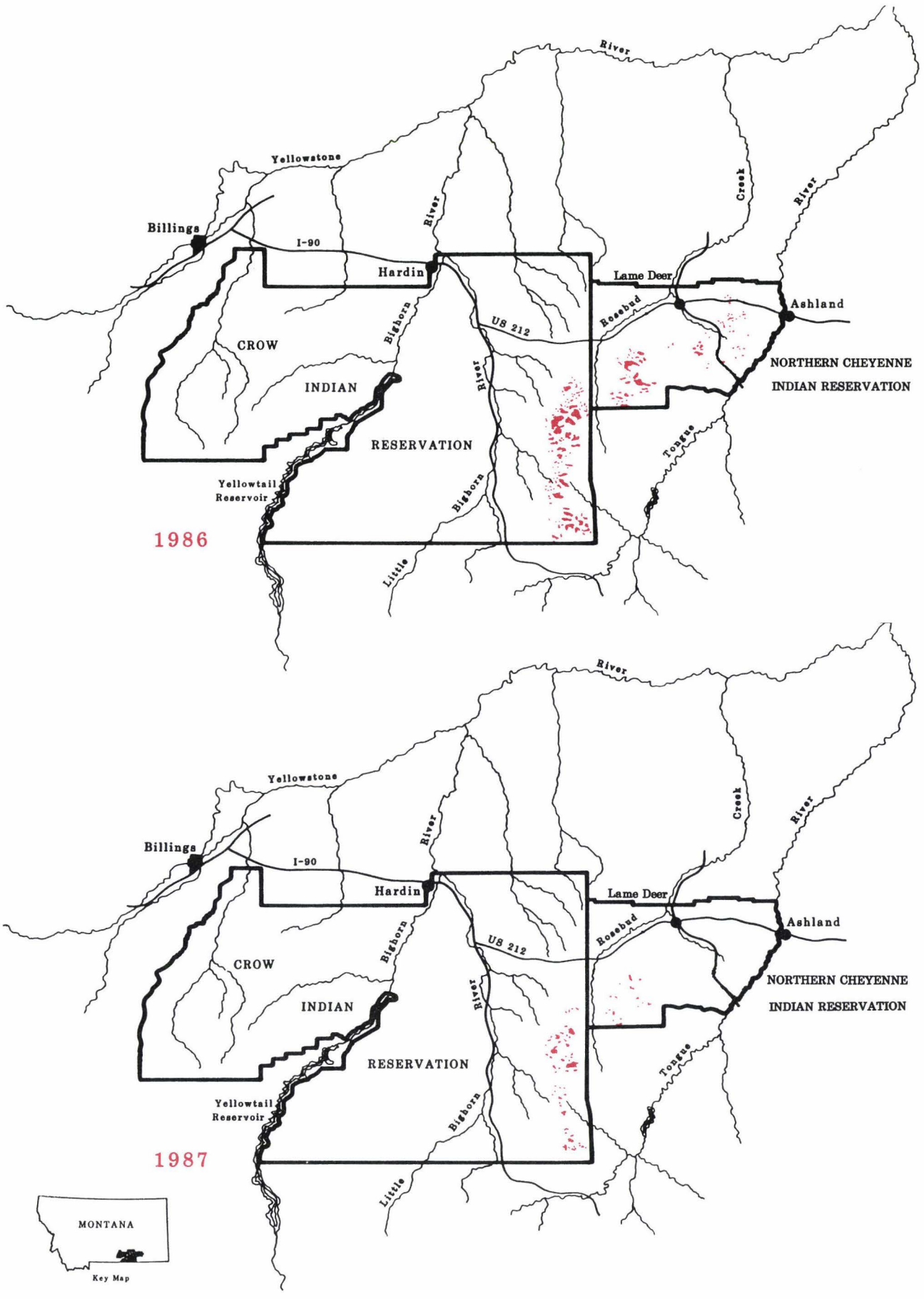

Figure 12.--Areas of pines infested by mountain pine beetle, Crow & Northern Cheyenne Indian Reservations, Montana.

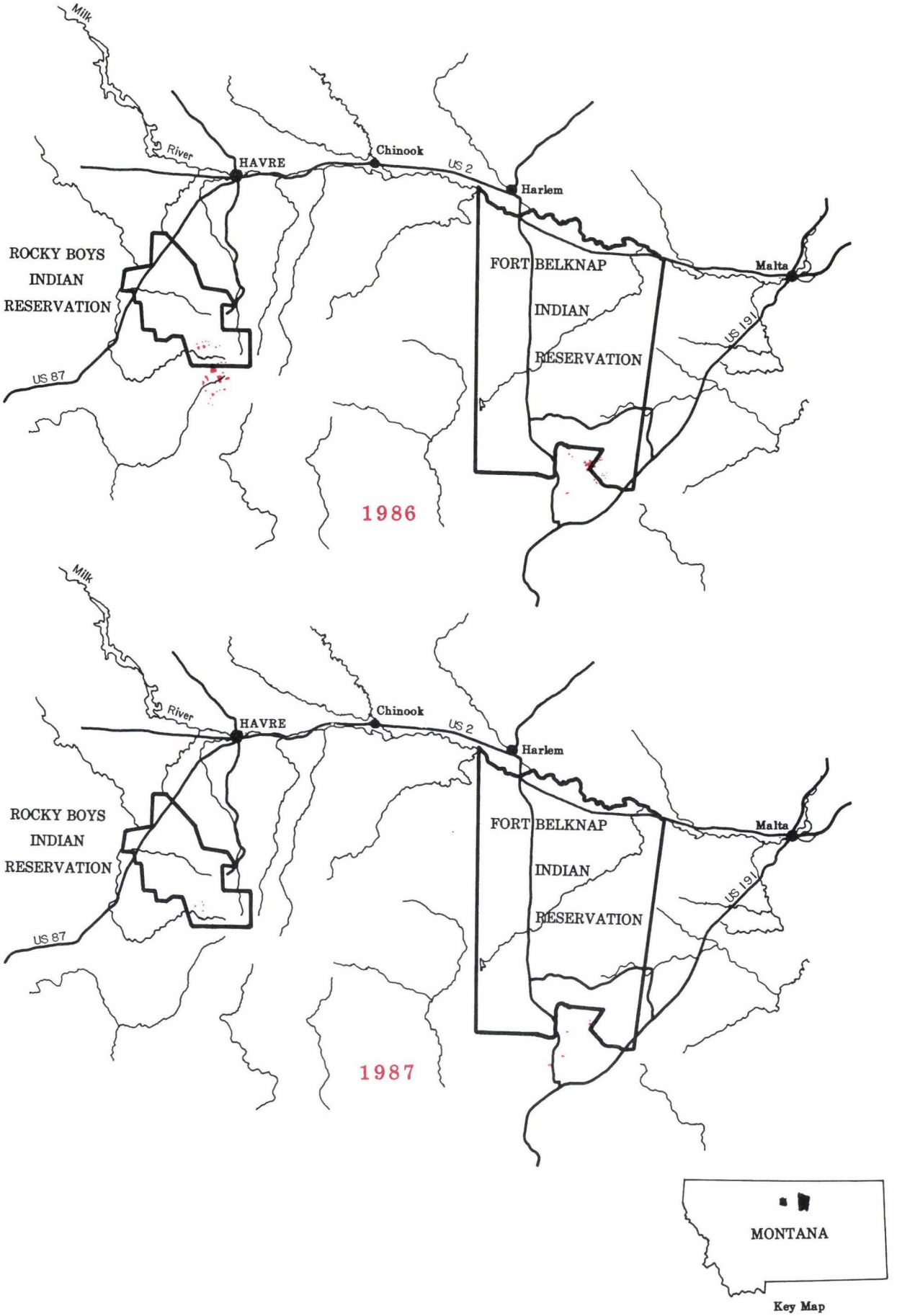

Figure 13.--Areas of pines infested by mountain pine beetle, Rocky Boys & Ft. Belknap Indian Reservations, and Bureau of Land Management lands, Montana.

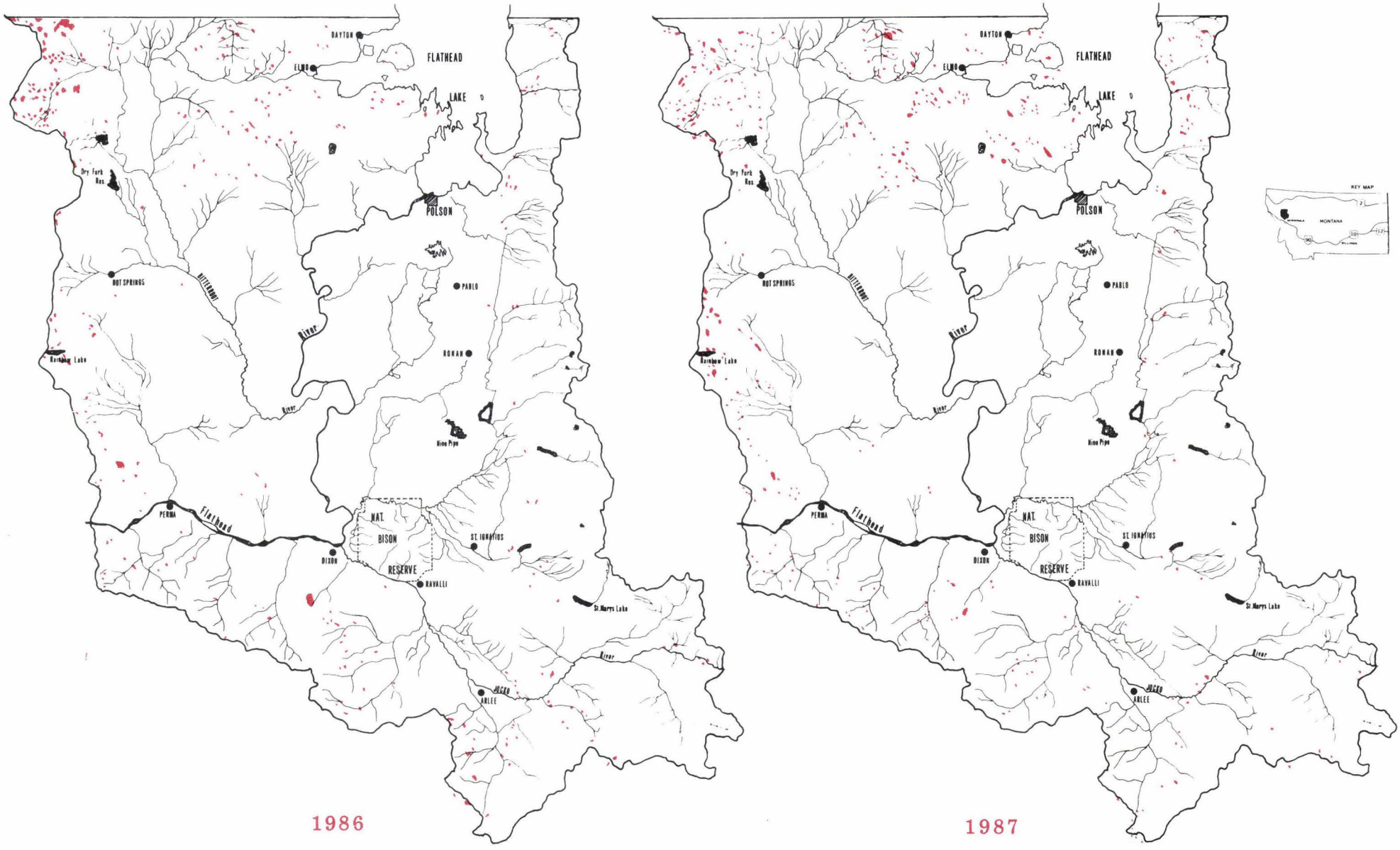

Figure 14.--Areas of pines infested by mountain pine beetle, Flathead Indian Reservation, Montana.

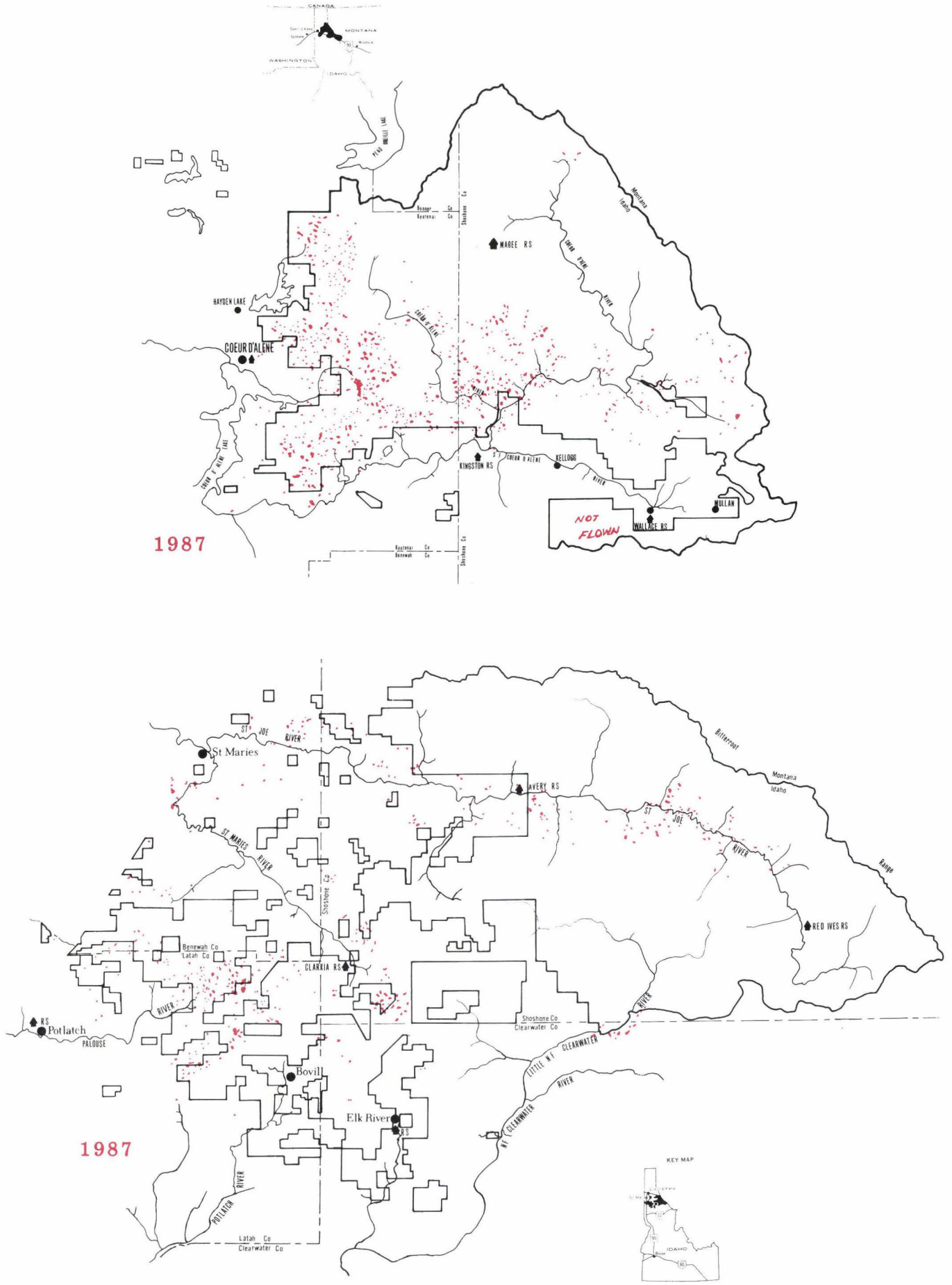

Figure 15.--Areas of Douglas-fir infested by Douglas-fir beetle, Idaho Panhandle National Forests (Coeur d' Alene & St. Joe NF's) area, Idaho.

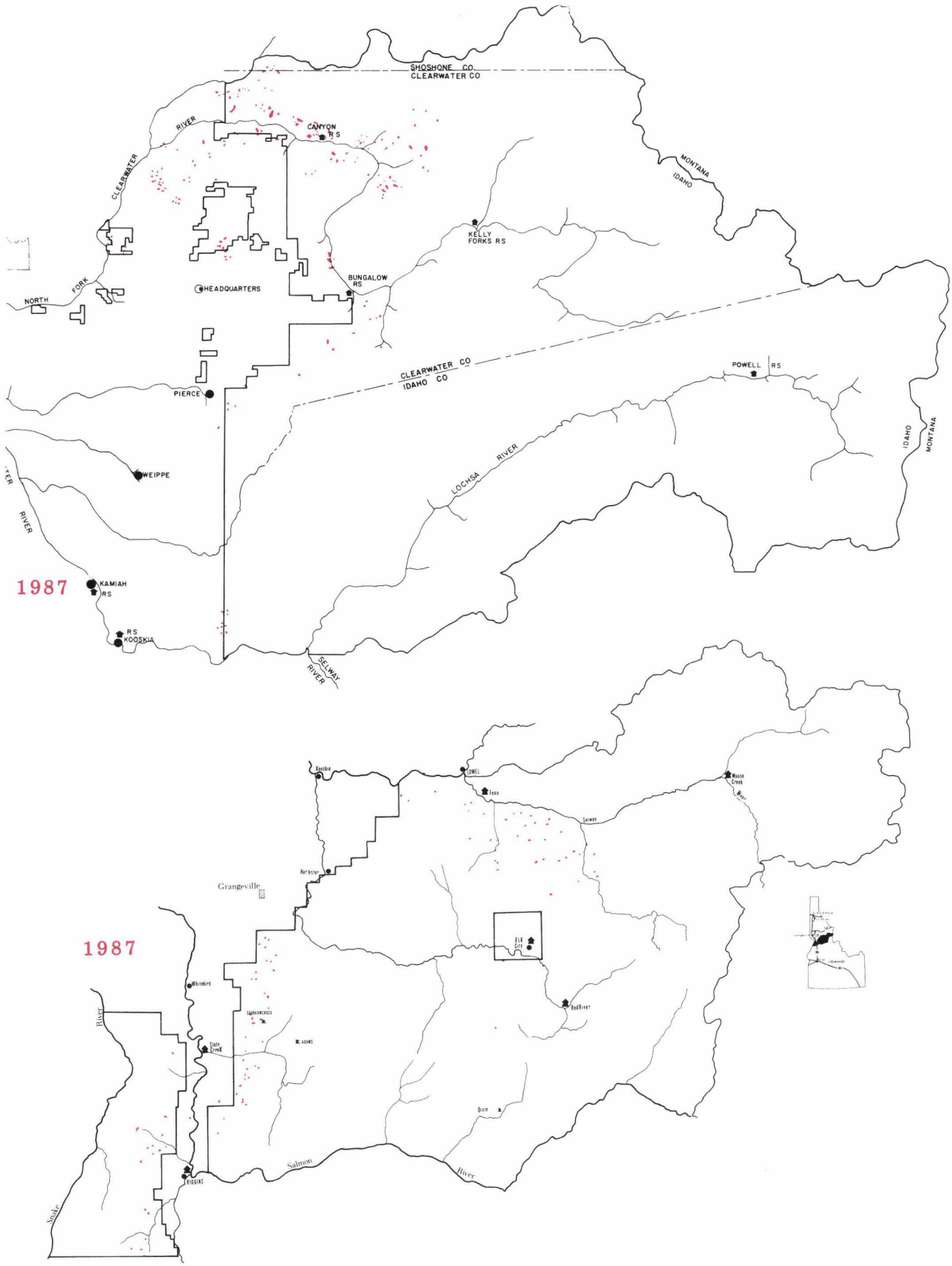

Figure 16.--Areas of Douglas-fir infested by Douglas-fir beetle, Clearwater & Nezperce National Forest areas, Idaho.

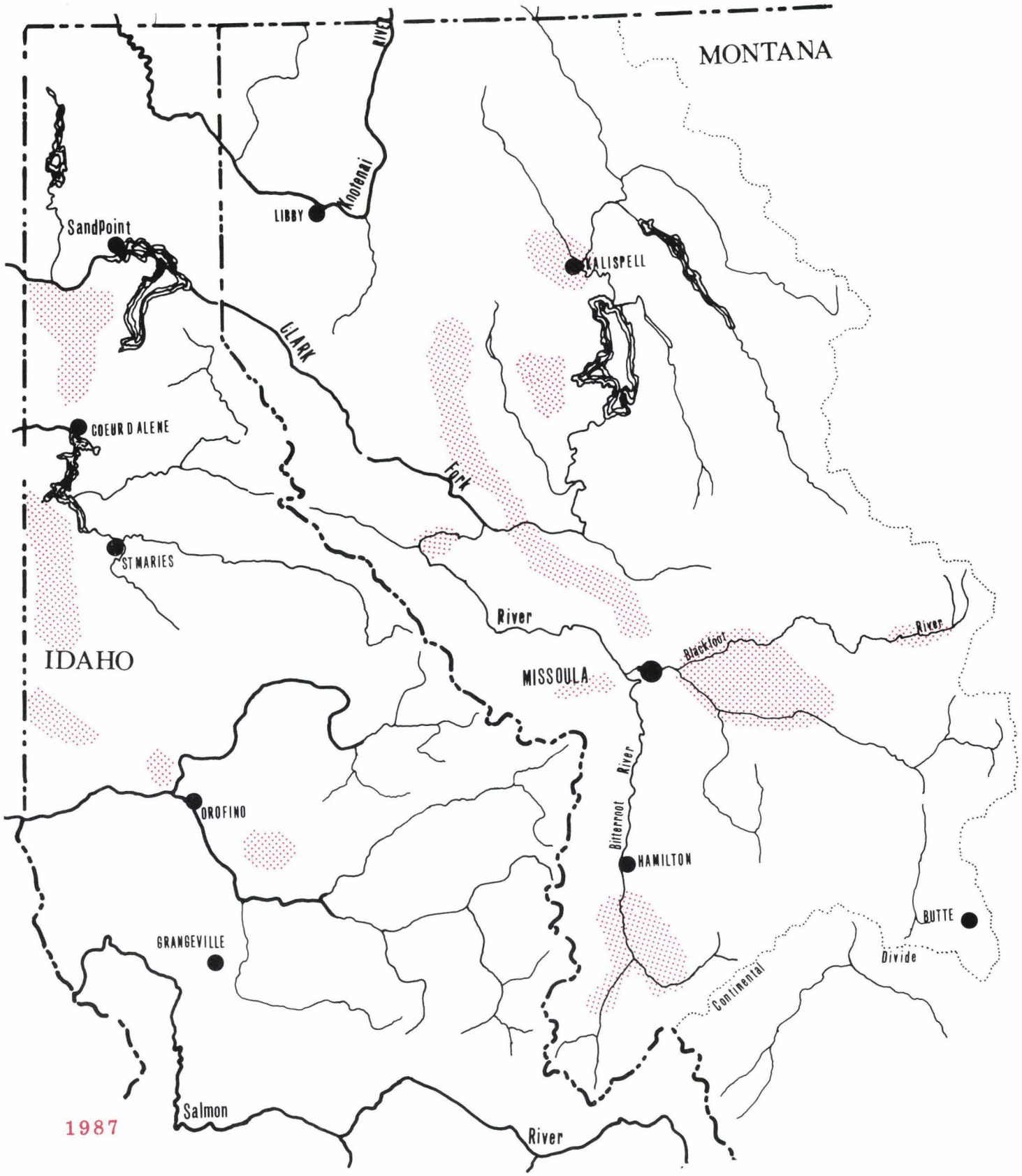

Figure 17.--Areas of pines infested by pine engraver beetle, western Montana and northern Idaho.

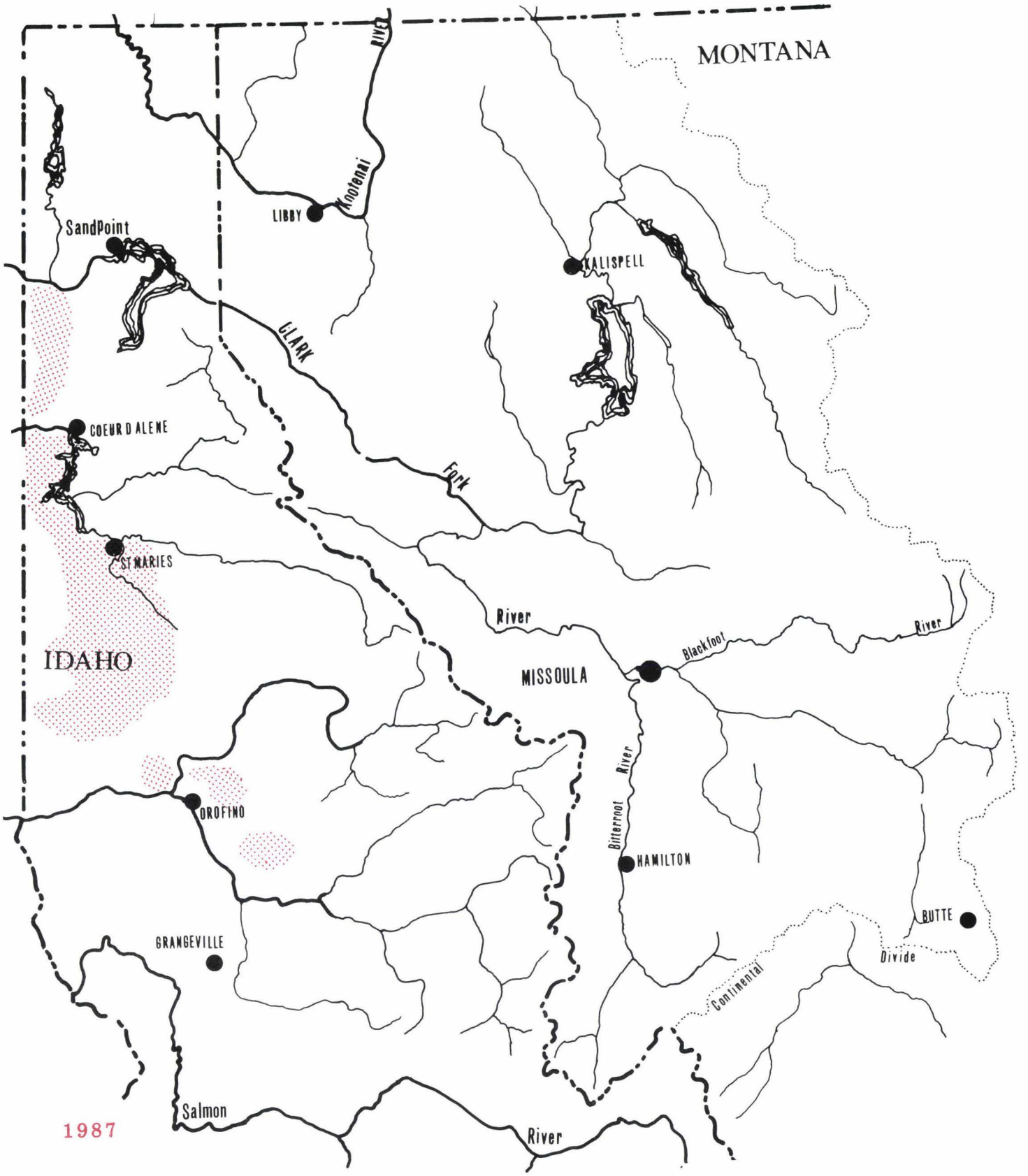

Figure 18.--Areas of grand fir infested by fir engraver beetle, northern Idaho.